DEVELOPING A STANDARD OPERATING PROCEDURE FOR FIREFIGHTING AT MULTI STOREY BUILDINGS IN THE AUCKLAND REGION OF THE NEW ZEALAND FIRE SERVICE

EXECUTIVE ANALYSIS OF FIRE SERVICE OPERATIONS IN EMERGENCY MANAGEMENT

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ABSTRACT

The National Commander of the New Zealand Fire Service required that the Fire Regions under his control develop a local standard operating procedure (SOP) for multi storey building fires. The Auckland Fire Region had such a procedure but it was out of date and in need of review as it did not reflect current resourcing or organisational structure. There was also a need to ensure that a multi storey building procedure provided sufficient flexibility to enable varying levels of initial emergency response and still work effectively irrespective of the size and complexity to which incidents might develop.

This research project sought to provide an agreed definition for multi storey buildings in the Auckland Region and to identify some of the key lessons experienced by overseas fire departments involved in significant high rise fires over the last twenty five years. A draft Multi Storey Building Local Procedure for the Auckland Fire Region was also to be developed as part of the project.

Historical, descriptive and action research methodologies were used to develop a proposed definition and to identify the key components of the draft Local Procedure based on some of the lessons learned by other departments as well as the results from a locally conducted focus and a survey of Chief Fire Officers from the New Zealand Fire Service.

Findings resulted in an agreed definition of a multi storey building being three floors or more with key lessons focussing on the need for departments to understand the complex and challenging nature of high rise fires. Important issues such as the implementation of a structured Incident Command System, the potential for rapid and uncontrolled fire spread, large numbers of occupants requiring evacuation as well as significant resource deployment and logistical issues for fire departments attending a multi storey building fire were discussed. A draft local procedure was written and then tested by means of a third alarm high rise exercise.

Recommendations centred on the need for the Auckland Fire Region to continue the feedback and review process using the draft local procedure and to exercise the final draft procedure before formally adopting it for the Region. It was also recommended that the Auckland procedure form the basis of a review of the national multi storey building procedure.

TABLE OF CONTENTS

INTRODUCTION

Over the past eight years the New Zealand Fire Service (NZFS) has undergone two significant organisational restructures. These have necessitated changes to both national and local SOPs. Procedures have either become very generic in nature, providing little specific guidance for operational personnel or have remained in a form which no longer reflects current best practice and potential incident response levels.

In particular the current High Rise Local Procedure for the Auckland Fire Region (Appendix A) was last given a cursory review in 1997. This review sought only to change terminology and format to ensure compliance with the Auckland Region's operational structure following a national organisational restructure in the same year. The detail of the procedure and the Region's approach to multi storey building incidents was not specifically reviewed in any significant depth.

National procedures (National Commander's Instructions) have also shifted from being very detailed and prescriptive documents to what could now be described as very generic in nature. This is an attempt to recognise the vastly different resourcing levels and hazardscapes between metropolitan brigades and their provincial counterparts. Any national operational procedure, by definition, has to be relevant for both types of brigades and their respective risks if it is to be of any value. The current national multi storey building procedure (Appendix B) is, in effect, an instruction to Fire Region Commanders regarding the essential elements that shall be incorporated into their local procedures. In addition a brief list of potential hazards and mitigation strategies during firefighting in multi storey buildings is also included.

The purpose of this applied research project is to review and redraft the Auckland Fire Region local standard operating procedure for multi storey building incidents, in line with international contemporary practice, as well as meeting the needs of local Chief Fire Officers.

Once developed the procedure is to be tested by means of an actual exercise utilising Auckland Fire Region personnel and resources. Following on from the development of the detailed local procedure a more generic national procedure is to be developed utilising the Auckland Region procedure as the base document. This should ensure that the national document contains sufficient detail to be of value to fire service officers across the country without becoming too prescriptive and not reflecting the varying local resource capabilities. Historical, descriptive and action research methods were employed to answer the following questions:

1. What constitutes an agreed definition for a high rise building with regard to fire service operating procedures in the New Zealand Fire Service?
2. What have been the identified problems and lessons learned from significant high rise fires that have occurred internationally in the last 20 years?
3. What is contemporary practice with regard to fire service operations at Multi Storey Building incidents and therefore suitable for inclusion in a SOP for the Auckland Fire Region of the New Zealand Fire Service?

BACKGROUND AND SIGNIFICANCE

> Fires in high rise buildings have challenged the fire service for over a century. Devastating losses of both life and property have occurred because of these fires. Every fire department who (sic.) might be called upon to fight a high rise building fire is well advised to develop and practice a standard operating guideline specifically addressing the unique nature of these fires. (Richter, 1995).

One of the critical success factors in successfully managing a fire in a multi storey building is the implementation of a robust, well exercised and fully understood SOP. Under sections 17N and 27A of the New Zealand Fire Service Act 1975 one of the responsibilities

of the NZFS National Commander is the issuing of operational instructions from time to time. It is essential for any modern fire service to adopt a consistent, best practice approach to various types of incidents. This ensures that operational officers are able to command and control an incident with the confidence that they are implementing strategies based on a sound rationale of contemporary practice. It will also assist other officers on the fireground to understand both the strategic and tactical approach being taken as well as the fireground organisational structure and facilities that are to be implemented at any given incident. Arguably, it is even more important that this consistent, best practice approach is adopted at a multi storey building fire, as this type of incident can severely stretch the operational capability of even the largest fire brigades. The fact that significant multi storey building fires occur relatively infrequently also means that the complex and unique problems associated with these incidents are not regularly experienced by fire service officers, reinforcing the need to have a standard procedure to guide decision making, tactical approach and resource deployment.

Successive organisational reviews and consequent restructuring of the New Zealand Fire Service has meant that both the national and local SOPs have at times been inconsistent with each other and the operational environment within which they were designed to operate. In particular, the National Commander's Instructions have gone from being very detailed, prescriptive procedures to the opposite end of the spectrum, often becoming generic guidelines which officers may find of little value and relevance when trying to implement a standard approach to fire incidents. The decision has been taken at a national level that the National Commander's Instructions are in need of review to better meet the needs of frontline officers when making fireground decisions and adopting the appropriate tactical approach to various types of incidents. The Auckland Fire Region is currently undertaking a review of a

number of its Local Procedures in line with the national review of the National Commander's Instructions.

The current Auckland Region procedure is considered to be out of date and is based around the provision of specific and detailed instructions and task allocations for initial arriving crews. The current procedure also presumes a minimum four pump initial attendance at all multi storey buildings which means that the procedure doesn't work practically when there are fewer resources available on the initial response. The New Zealand Fire Service is currently reviewing the predetermined attendance for calls to buildings with monitored fire detection and suppression systems due to the fact that such a high proportion of these calls are false alarms requiring no fire service intervention. A Private Fire Alarm discussion document (Appendix C) outlines the background and proposal that such calls should receive an initial dispatch of one fire appliance to investigate the nature of the incident. It also suggests that Chief Fire Officers may elect to increase the pre determined attendance on first alarms after conducting a risk assessment of the building and determining that an enhanced attendance is justified.

In the event that the recommendations included in the discussion document are adopted then the current multi storey building procedure becomes unworkable in that it assumes four appliances on the first alarm with specific duties for each crew upon arrival. The intention of this research project is to develop a draft procedure that allows sufficient flexibility for Incident Controllers to manage fireground resources irrespective of the number of appliances on initial attendance, subject to a minimum attendance of two appliances. It was considered important to draft a procedure that gave specific instructions for the first two arriving crews only. Should there be resources available over and above that on the first alarm then the Incident Controller should be allowed to determine their deployment after adopting the appropriate risk assessment and deciding on the tactical approach to the incident.

This would minimise the degree of automatic crew tasking and deployment dictated by the operating procedure, as currently occurs, rather than as a result of a needs assessment and task prioritisation being determined by the Incident Controller.

By researching the opinions and requirements of Chief Fire Officers within the New Zealand Fire Service, as well as undertaking a review of selected multi storey building procedures from some large overseas departments, it was hoped that a new procedure could be developed that better met the needs of Incident Controllers responsible for managing fires in multi storey buildings. This research is seen as the first step in developing a new multi storey building procedure in full consultation with Chief Fire Officers and frontline operational staff. The draft procedure is to be tested by means of a practical exercise before being distributed for wider comment. After this process has been completed the adopted draft is to be published and then reviewed again in 12 months time to ensure that issues identified in the day to day application of the procedure are addressed and any required changes made.

The National Fire Academy's Executive Analysis of Fire Service Operations in Emergency Management emphasises the need for operational preparedness and planning. By undertaking a comprehensive review of the SOP for multi storey building incidents the Auckland Fire Region will be taking a proactive approach to enhancing its emergency response capability. It is hoped that the outcomes of this research project will provide a more contemporary and best practice approach which will help to ensure a positive outcome at any future multi storey building fires in Auckland.

LITERATURE REVIEW

> For a fire department, the high rise building is a potential risk from the time it becomes an addition to the community. The unusual height, size and shape of the structure is likely to magnify each weakness simply because there is a greater volume of materials, more people to perform acts of carelessness, and more channels and draft spaces through which fire can spread. (Pittsburgh Bureau of Fire, 1992).

Many words have been penned on the subject of high rise firefighting and most agree that it is virtually impossible to control a severe fire on the upper floors of a tall building. Some of the factors that support this belief are the fact that high rise buildings can have large open floor spaces with high fire loading (Carter, 1992; Dunn, 1995; Bennett, 2000; FDNY, 1997). There are usually longer response times for first arriving crews to ascend to the fire floor. The height of the fire takes away the ability to use large calibre streams from the outside of the building. Naturally occurring air currents can have an adverse effect on a fire in a building of significant height. Once a severe fire has taken hold it can only be fought from the staircase of the building. The high temperatures generated and the time it takes firefighters to get to the fire floor place a heavy logistical burden on firefighting resources. (Poplar Fire Station website, 2003).

For all the reasons outlined above it is imperative that any fire department that has a multi storey building risk within its area is sufficiently prepared to deal with an emergency response to such a structure. The United States Fire Administration (1999) defines standard operating procedures (SOPs) as “written guidelines that explain what is expected and required of fire service personnel in performing their jobs. A comprehensive set of SOPs defines in significant detail how the department intends to operate”. It is also important to differentiate between SOPs and technical or training information. “Stated differently, SOPs don’t describe how to do the job (technical skills), they describe the department’s rules for

doing the job (procedural guidance)" (ibid.). The New Zealand Fire Service approach to developing SOPs is that they are not mistaken for training documents but that they are clear guidelines to assist officers to apply a consistent rationale and tactical approach to incidents of a similar nature.

Before considering some of the significant high rise fires that have occurred, and the implications for firefighters from some of the lessons learned, it is worth considering how we might define a high rise building. Dunn (2003) argues that a high rise can be defined as a building which is above a department's tallest aerial appliance or extension ladder. He suggests when a building is beyond the reach of a department's tallest aerial or ladder then the only strategy available to firefighters is an interior attack. The Pittsburgh Bureau of Fire (1992) develops this definition further in its high rise SOP when it states that a "high rise building may be defined as one that lacks viable exterior access to the upper floors for firefighting, and where firefighters must place complete reliance on the building's systems and components for fire suppression". The two significant issues are that the exterior of the building is beyond a department's reach and that fire suppression tactics have to be supported by fixed systems incorporated into the building. The issue of human occupancy on upper floors and the level at which the fire department can gain vehicle access to the building may also be considered when defining a high rise building.

The previous definition for a high rise building in the Auckland Fire Region incorporated the requirement for buildings over twenty five metres (approximately 75 feet) in height to have a riser main fitted as per the New Zealand Standard 1900. Thus it was decided that all buildings over twenty five metres in height would have the high rise procedure invoked. There was in addition, a non-binding recommendation to building owners that risers should be considered for buildings of four floors or more. Officers in charge were also allowed to apply the procedure to buildings under twenty five metres if there was a riser fitted

or if implementing the procedure would increase the effectiveness of fire suppression operations (Auckland Operations Centre, 1996).

There have been a number of well documented fires that have occurred in multi storey buildings internationally. Some key points of learning can be taken from the experience of other departments in assisting to prepare a local SOP. The attack and subsequent fire and collapse of the World Trade Centre towers in 2001 has been expressly excluded from this research project on the basis that the incident does not fall into the category of the "traditional" high rise fire, if such a term can be used. The events and causal factors involved in that incident go beyond what most fire department's would consider the norm in their procedural preparations and planning in the area of high rise. Arguably, three of the more significant high rise fires to occur in recent times were the First Interstate Bank fire in Los Angeles (1988), the One Meridian Plaza fire in Philadelphia (1991) and the New York City Bank fire occurring in 1993. By examining these three significant fires some common themes emerge which could impact on the review of any multi storey building SOP. These include the need for a coordinated incident command system to manage the significant logistical issues, the potential for fire and smoke spread in multi storey buildings, ventilation operations, and the use of lifts and stairwells by firefighters at a multi storey building fire.

Routley (report 082) asserts that "fires in highrise buildings generally require more complicated operational approaches than most other structure fires. Tasks that are normally considered routine for most fire departments, such as locating and attacking the fire, evacuating occupants, and performing ventilation can become very difficult in highrises". Chapman (1995) agrees that even relatively small fires in a high rise structure demand fire department resources beyond those required at comparable events involving low rise structures. One of the key functions of any incident command system is that it have the

ability to expand and remain flexible enough to include additional positions or functions demanded by high rise operations (Smith, 1995).

The Los Angeles Fire Department demonstrated its preparedness for an event such as the First Interstate Bank fire when it developed an Incident Management System that would provide effective organisational control “through the assignment of specific duties to specific people and by allowing flexibility for organisational growth if the fire incident escalates” (Gerard, 1981). In fact, the high rise incident command system proved particularly effective in managing this incident. Despite the massive numbers of companies and firefighters on scene, the Fire Department maintained good organisation at the scene and effectively managed their resources (Routley, report 022; Building Official and Code Administrator Magazine, 1989).

The experience of the Philadelphia Fire Department at One Meridian Plaza was not as positive. Routely, Jennings and Chubb (report 049) comment that when faced with multiple building system failures safety-oriented strategies should dominate command decisions. In essence, the command and control system must default to conservative and safety-first tactical decision making when command personnel are faced with an “unknown and unanticipated situation, since the potential consequences of fireground decisions can rarely be fully evaluated during the incident”. Sadly, three firefighters lost their lives at this incident. As a result of its experience at Meridian Plaza and the Penn Mutual fire in 1989 the Philadelphia Fire Department revised its operational procedures to enable “the incorporation of the department’s incident command system procedures into the high-rise operational procedure” (Dyer, 1996). “The key [therefore], to operational success lies in the communications, coordination and strategic decision making abilities of the Incident Commander” (Carter, 1992) within the wider context of a flexible and coordinated incident command system.

Fire and smoke travel during a multi storey building fire can create significant operational problems for firefighters with regard to fire suppression and occupant evacuation. The experience in the One Meridan Plaza fire demonstrated that unprotected penetrations through fire resistant construction and the absence of fire dampers in ventilation shafts permitted fire and smoke to travel vertically and horizontally (Routley et al, report 049). In addition, auto exposure up the external face of the building was a primary means of fire spread and resulted in the fire only being extinguished when it reached a sprinklered floor some eight levels up from the initial ignition floor. Vertical fire spread and fire development was also a major factor in the First Interstate Bank building fire and was enhanced by the open floor plan and inadequate compartmentalisation. Firefighting procedures must allow for the potential for uncontrolled fire spread and the impact on firefighters and evacuees alike. The objective of any SOP must be to limit fire travel and remove smoke from as many areas as possible (Bennett, 2000).

The removal of smoke and other fire products by means of fire service initiated ventilation is a key consideration for incident commanders at multi storey building fires. The experience at a high rise hotel fire in Las Vegas, where 85 people situated on upper floors died from smoke inhalation spread through a central air conditioning system, demonstrates the deadly consequences of uncontrolled smoke travel in a high rise building (Iklim, 2003). The use of building heating and ventilation systems (HVAC) to facilitate smoke removal is a common firefighting strategy in modern high rise building fires and needs to be included in any standard operating procedure. “A well planned approach to ventilation with specific plans for the effective use of personnel and equipment is essential” (LA Fire Department, 1995). However, Routley (report 082) argues that ventilation in a multi storey building can be much more complex than other types of structures, with vertical ventilation often limited to stairways or elevator shafts, “both of which may also have to be used to evacuate

occupants". This is supported by the Pittsburgh Fire Department (1992) SOP in its discussion of approaches to ventilation where it states that the "timing and coordination of tactics are extremely important" [as once a stairway is used for ventilation it] "is useless for rescue operations, access and escape".

"Since the advent of high-rise buildings, there have been incidents in which firefighters have been killed or severely injured in uncontrolled elevators during high-rise firefighting operations" (Leihbacher, 2003). The use of lifts by fire service personnel has always been a contentious issue as multi storey buildings continue to be built taller and taller. Dunn (2000) confirms the hazardous nature of lift use by relating the request from the Fire Department of New York to have a Phase III elevator (car located in a fire protected enclosure with a wiring system insulated from the effects of water) installed in all multi storey buildings. The lack of lifts available for delivering firefighter personnel and equipment was a problem in the First Interstate Bank fire and it was only due to the fact that the fire was on the fifteenth floor, and not higher that the problem was not compounded further (Routley, report 022). A security guard investigating the fire at One Meridian Plaza had to be rescued by co workers after the lift he was in opened on the fire floor exposing him to the products of combustion (Routley et al, report 049).

It is clear that the use of lifts by firefighters during an involved multi storey building fire is fraught with danger. Yet the practical realities of dealing with fires in extremely tall buildings means that lift use by firefighters and evacuating occupants has to be factored in to SOPs and department training. Both the Los Angeles and Pittsburgh Fire Departments' SOPs, point out the hazards associated with lift, but use do not expressly forbid their use, recommending that the use of lifts be restricted until the safety of the lifts is fully determined (LAFD, 1995; Pittsburgh Bureau of Fire, 1992). The experience of the Moscow Fire Department during the Ostankino Tower blaze resulted in firefighters ignoring their standard

procedure of not using lifts. However, the Department Deputy Chief was adamant that "the formal obeying of rules would have ended in dozens of victims" and that firefighters began using lifts when they "were sure the fire had not reached downwards to the top of the elevators" (Stewart, 2000). When used in conjunction with stairs lifts can assist in substantially reducing total evacuation times for tall buildings. Groner (2002) argues that while the engineering challenges of fire-safe lift design are well understood the "human interface and procedural challenges require much more attention and very careful thought and design".

Another key issue to be considered in multi storey building operations is the control and use of stairwells for both evacuation and firefighting operations. A number of authors (Dunn, 2000; Carter, 1992; Chapman, 1995) advocate the strategy of reserving one stairwell for firefighting operations and one for evacuation, where two distinct stairwells exist. In the First Interstate Bank fire the concept of maintaining at least one stairway free of smoke for evacuation purposes proved to be ineffective (Routley, report 022), although it was acknowledged that the strategy may have been valid for a less severe fire. What is clear is that any fire attack strategy needs to incorporate the potential for multiple building occupants trying to use the same stairwells as firefighters. Because of the time needed to fully evacuate a large multi storey building it is a recognised strategy to fight the fire while keeping occupants in place in safe areas of refuge. However, as Dunn (2000) suggests a "defend in place strategy depends on two factors: that the building has the ability to contain fire to a particular area and that the occupants will obey the fire chief's instruction to stay in place. Neither of these two assumptions is necessarily true."

The other key issue involving stairways in multi storey buildings is that they necessitate the mobilisation of large numbers of firefighters to transport equipment up to the fire floor. The logistical challenge of deploying fire crews and sufficient equipment to

maintain suppression activities over a long duration is significant. The New York City Bank building fire demonstrated the massive numbers of firefighters needed in both suppression and support roles. The logistical functions of assembling and transporting firefighters and equipment via stairwells are very demanding and are likely to result in numerous injuries particularly through firefighter fatigue (Routley, report 071). The requirement for a SOP therefore is to enable good stairwell support organisation and to raise awareness of the real danger of firefighter fatigue and ensure adequate rest and rehabilitation is provided for.

In conclusion, a review of contemporary international literature on the subject confirmed that there are many significant factors which fire departments must take into account when conducting operations at a multi storey building fire. Traditional fire suppression strategies are not always available to the incident controller. This fact, coupled with the size, occupant numbers and distinct design characteristics of multi storey buildings, means that any SOP has to be comprehensive in nature without being so prescriptive as to limit fireground adaptability and innovation to deal with unforeseen challenges. The development of any SOP "is most effective when a well planned, standardized and comprehensive process is followed" (USFA, 1999). Such a planned approach to SOP development will help to ensure that fire departments responding to multi storey building incidents are well prepared to operate in the complex environment that results.

PROCEDURES

Definition of terms

Various publications utilised during the course of this research project adopted either of the terms high rise building or multi storey building when describing a building of multiple floors. For the purpose of convenience both terms can be assumed to be an adequate description of a multiple level building.

Incident Controller: the fire service person in overall command of an incident where the fire service is the lead agency.

Riser System: An inbuilt hydrant system in a multi storey building enabling firefighting water to be pumped from street level to upper floors

Research Methodology

This research project sought to identify the key components necessary for inclusion in a multi storey building SOP as well determining an agreed definition for a multi storey building that ensured the appropriate enactment of the procedure. It also sought to determine some of the lessons learned from significant high rise fires fought internationally.

Historical research was conducted in order to determine international experience with regard to firefighting in multi storey buildings. Literature was reviewed principally from the United States of America through the Learning Resource Centre at the National Fire Academy. Literature was also sourced from the New Zealand Fire Service Information Centre.

A focus group meeting was held on 1 October, 2003 and was comprised of a convenience sample including one Assistant Regional Commander, four Chief Fire Officers, three frontline operational officers and one Fire Engineer, all from the NZFS. The focus group was conducted to try and determine some of the key local issues with regard to developing a multi storey building procedure. Participants were asked to discuss and determine the key components of a multi storey building SOP. Participants were also canvassed for some of their suggested solutions to identified problems in multi storey building firefighting and command and control. The results of the focus group meeting helped to determine the content of both the survey instrument and the draft local procedure.

Following the focus group meeting a survey instrument (Appendix D) was designed and distributed to career Chiefs and Deputy Chiefs in the New Zealand Fire Service. The questionnaire sought opinion and information on multi storey building definitions, past history and local multi storey building risks, topics for inclusion in a SOP, pre determined first alarm responses and potential hazards involved in multi storey firefighting. Population and sample sizes, along with the response rates are detailed in *Table 1*.

Table 1

Sample Group	**Population**	**Sample Size**	**Response Rate**	**Respondent numbers**
Career Chief Fire Officers and Deputy Fire Officers	40	40	62.5%	25

Action research was also undertaken in that survey results, literature review and focus group discussion were used as the basis for drafting a new procedure which was distributed for comment amongst a selection of operational officers, as well as being practically tested by means of a third alarm exercise. The exercise was held in the Auckland City Central Fire District in January 2004 (Appendix F). Comment and feedback regarding the draft procedure will assist in writing the final draft of the procedure. This process sits outside the scope of this research document as the key objective was to create a draft document able to be tested and reviewed.

Assumptions and Limitations

One limitation to the project was that the multi storey building exercise did not fully replicate the operational challenges that might occur in a real high rise fire. The wider Chief organisational comment and feedback process on the draft procedure sits outside this research

project due to the time required to undertake such a process and the deadline for submission requirements of this project. A full review and feedback process is recommended for the future. This means that the draft SOP included in this project may not necessarily equate to the final version.

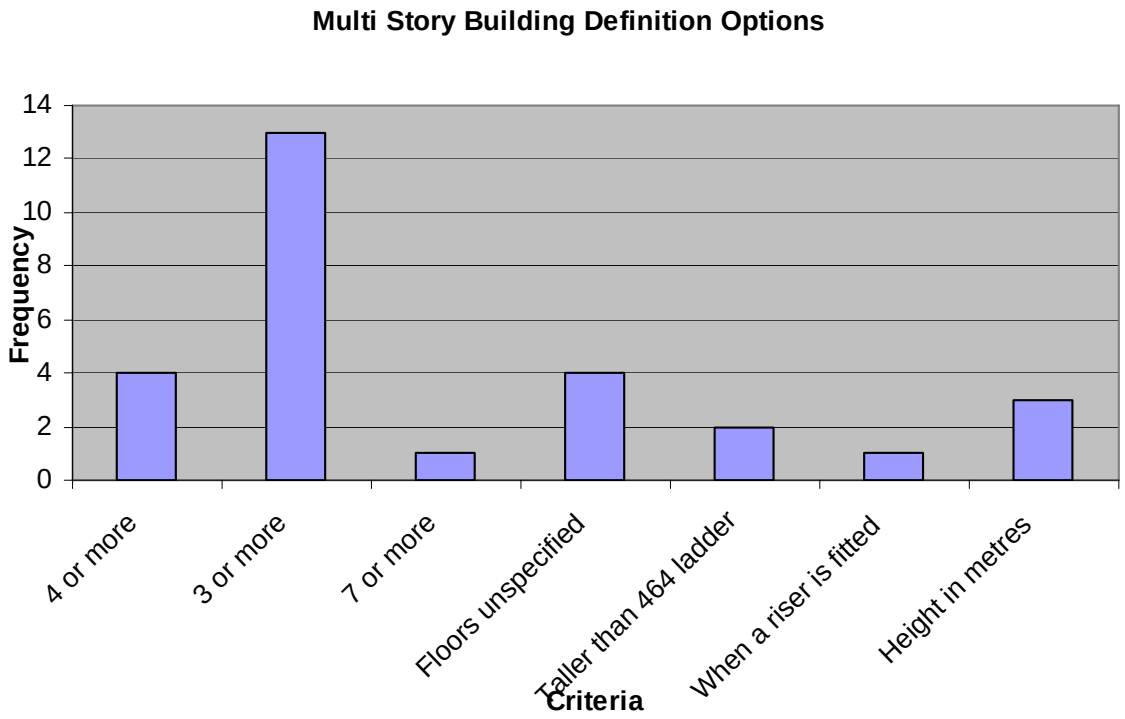
RESULTS

Research Question 1

In a review of twenty fire departments' SOPs, conducted by Richter (1995), fourteen contained some form of definition for a multi storey building. Definitions ranged from determining a minimum number of floors, to set criteria based on the measured height in feet from street level, with a number of departments attempting to provide a functional definition linked to the working height of aerial appliances, or buildings where the fire attack is restricted to internal operations.

A survey of New Zealand Chief Fire Officers resulted in a significant (80%) preference for a definition based on the number of floors of a multi storey building (*Chart 1*). A small number of responses suggested that a definition be functionally based, such as buildings taller than fire service ladders, or when a riser system was fitted. Another small number suggested a height measured in metres be used as the agreed definition. Of those responses suggesting a floor number based definition the significant majority favoured a definition of 3 floors or more before the multi storey building SOP is put into effect.

Chart 1



Research Question 2

The survey results showed that the New Zealand Fire Service has some degree of experience in multi storey building firefighting (Appendix F, *Chart 3*). However, the number and scale of multi storey building fires in New Zealand over the last ten years has still not approached anything like the experience of some of the larger overseas fire departments. Therefore, it was appropriate to base the answer to this question largely on the literature review undertaken. Some of the lessons learned and issues arising from the third alarm exercise conducted as part of this research project also tended to support the findings of the literature review in certain areas. Comment has been included on initial findings from the exercise as part of this section.

It was apparent that fires in multi storey buildings often provide a consistent and often repeated list of lessons learned for fire departments, not the least of which was the difficulties

experienced in fighting fires in buildings without automatic sprinkler systems. Arguably one of the most significant examples was the experience at the One Meridian Plaza fire where the fire consumed eight floors of the building before finally being brought under control by ten sprinkler heads on a floor which happened to have an automatic system (Eisner & Manning, 1994). The effectiveness of sprinklers and the benefit to fire department operations can not be overstated, particularly with regard to high rise firefighting.

The need for an organised and clearly communicated fireground incident command structure was also a recurring theme in much of the literature reviewed. Even in significantly large and challenging fires the implementation of an effective incident command system with clearly understood roles, responsibilities and terms was considered to be a key factor in successfully controlling the fire. There was also a clear need for departments to fully understand the resource requirements demanded by a multi storey building fire and the logistical challenges inherent in any large scale mobilisation of firefighters and equipment. The requirement for fire department personnel to pre plan and exercise their response and suppression strategies was emphasised in a number of fire incident reports and SOPs (Pittsburgh Bureau of Fire, 1992; FDNY, 1997; LAFD, 1995; San Francisco FD, 1999).

The inherent risk to firefighters of using lifts during fire operations in multi storey buildings was a topic discussed in much of the literature reviewed. Numerous examples of firefighter deaths or lucky escapes involved the use of lifts. The dangers of lift use was supported by a study carried out by the FDNY Fire Prevention Bureau, cited by Leihbacher (2003) which found that fire service override systems in lifts either failed or malfunctioned at one third of the major high rise fires in New York during the 1990s. It was interesting to note that NZ Chief Fire Officers surveyed did not perceive the use of lifts as a significant potential hazard to firefighters. While the normal approach of most SOPs is to prohibit the use of lifts there seems to be a growing recognition that in very tall multi storey buildings the use of lifts

to transport firefighters and equipment as well as evacuate occupants is becoming difficult to avoid (Stewart, 2000). However, any such use should not be made until a full risk assessment has been conducted and the lifts are deemed safe to use.

A key lesson emerging from some of the larger high rise fires was the myth that multi storey buildings were fire resistant and that the structure would contain the fire to the floor of origin. Poke-through construction, curtain walling and unprotected vertical shafts coupled with large floor areas, insufficient compartmentalisation and a high fire loading mean that once a fire takes hold the potential for uncontrolled vertical and horizontal fire extension is a reality. "Once a fire spreads beyond the floor of origin, the challenge to manual fire suppression forces is extreme and vertical spread may be uncontrollable" (Routley, report 071). It is essential then that fire suppression strategic and tactical decisions are made in full cognisance of fire conditions and likely fire spread potential. The mistake of initiating an aggressive fire attack strategy with insufficient resources against a fire with an exponential growth pattern may well prove extremely costly. Examples of firefighters becoming trapped by rapid fire spread, or having their escape route compromised, delivers an important lesson to firefighters to always have a planned escape that is being monitored and protected by back-up crews.

"Smoke movement in buildings is a complex problem which all fireground officers and firefighters should be aware of." (San Francisco Fire Department (SAFD), 1999). Stairwell contamination can severely hamper fire service operations. During the First Interstate Bank fire the ventilated vestibule design failed to keep heat and smoke out of the pressurised smoke tower (Routley, report 022). This was also the experience during the New York City Bank fire where a major fire coupled with the stack effect of the building overcame the stairwell pressurisation and filled the building with smoke. The flow-on effect of a smoke filled multi storey building is that far greater numbers of firefighters are required

to search all floors for occupants. The experience of stairwells compromised by smoke was even more tragic in the One Meridian Plaza fire where three firefighters sent to the top of a stairwell on a ventilation mission ran out of air and perished. HVAC systems can limit the spread of smoke and improve conditions for firefighters (SAFD, 1999). However, if systems fail due to the fire then the impact can be disastrous for firefighters. The potential failure of building systems and the impact on fire conditions of such failures must be factored into fireground tactical decision making.

Operations at a multi storey building fire are heavily reliant on effective fireground communications. During the First Interstate Bank fire the structural components of the building interfered with handheld radio communications (Routley, report 022) and the internal telephone system failed when wires melted due to fire conditions. It is imperative that fire departments have alternative means of communication built into their pre planning operations. In addition, it has also been the experience that radio communications can become easily overloaded unless strict radio discipline is exercised and there are an adequate number of channels available. This all points to the need for an effective communications plan to be devised early on in the incident and for all officers to understand the plan and any available communication alternatives.

Other lessons learned from significant multi storey building fires include the deadly hazard of falling glass from upper levels. This necessitates that a building safety cordon of up to 200 metres needs to be strictly maintained, along with a clear understanding by crews working on upper levels that permission should be sought before deliberately breaking any windows. Also of importance is the fact that a multi storey building fire will place tremendous resource requirements on fire departments and that sufficient resourcing needs to be allocated to logistics if fire suppression activities are to be maintained. Reports into the First Interstate Bank fire and the One Meridian Plaza fire discuss the role that firefighter

health and fitness has on the reduction of injury rates at such fires. The conclusion is that exposure to very dangerous situations can be mitigated “by physical fitness, good personal safety equipment and safety training” (Routley, report 022).

Finally, one of the most recurring lessons learned has been the importance placed on pre-fire planning and the need for such planning to identify building and fire protection features which may either help or hinder firefighting operations. Part of the pre-fire planning process must encompass the development of an effective SOP, training in multi storey building firefighting and the practical exercising of operational skills and department procedures.

From the third alarm exercise (Appendix G, selected images) conducted to test the practical application of the draft local procedure the following issues arose. Firstly, it must be noted that it is difficult to replicate the reality of an actual high rise fire during an exercise in a building under construction. This meant that all component parts of the draft multi storey procedure were unlikely to be fully tested. Issues such as lift use, building ventilation and automatic fire suppression systems could not be included in the exercise due to the unfinished nature of the building.

Despite these limitations the need for a clear and communicated incident organisational structure was reinforced. As the incident escalated in size and complexity there were a number of role changes as more senior officers arrived and took over command responsibilities. At times this resulted in some officers being uncertain who they were reporting to and which officers were fulfilling which roles.

The need to have sufficient space to establish the Safe Forward Point was graphically demonstrated as operations became congested with unassigned firefighters at the floor below the fire floor. Clearly marked areas of assembly and instructions for arriving officers and crews are required to more effectively manage resource levels. This problem was not

experienced by Lobby Control to the same extent because of the extra space available and also because of the fact that too many firefighters had been deployed straight to the Safe Forward Point rather than assembling at Lobby Control.

The conveyancing of equipment and breathing apparatus (BA) cylinders was not as well managed as they might have been. One example being that there were two types of BA cylinders on the fireground and certain BA sets that could only utilise one type. A firefighting crew came down from the fire floor needing to change cylinders only to find that the type of cylinders that had been transported to the Safe Forward Point were the wrong ones for their BA sets. This meant they were unable to be redeployed for some time until the correct cylinders had been transported up.

Other issues concerned the lack of any responding pumps or aerial appliances dispatched to the rear of the building to cover any exposure risk or access alternative entry points. The absence of a safe cordon zone meant that in the event of a real fire there might have been a severe safety hazard to firefighters operating at ground level. No apparent thought was given to establishing a stairwell support system and due to the relatively short duration of the exercise there was little opportunity to establish firefighter rehabilitation facilities.

It appeared that fireground communications were relatively well managed with senior officers operating a second “command channel” distinct from an operations channel for suppression and logistics crews. Trial Command packs and senior officer command jackets, deployed during the exercise also appeared to be worthy of future development as they provided an added tool to manage the establishment and organisation of some of the fireground facilities such as Lobby Control and the Safe Forward Point.

It is intended that further feedback and review will continue with regard to some of the operational lessons learned from the exercise and how these might influence further comment and modification of the SOP.

Research Question 3

A three phased approach was taken to determine what factors should be incorporated into a Multi Storey Building SOP. Results from the focus group discussion, existing multi storey procedures from other departments and, perhaps most importantly, responses to the survey of NZFS Chief Fire Officers were reviewed.

Standard operating procedures from the Fire Departments of New York, Los Angeles, San Francisco and Pittsburgh all included similar content in their procedures. Issues such as building features, alarm systems, attack strategies, lift use, ventilation, incident command system, stairwell operations, communications and salvage were all incorporated to various degrees.

The results from the focus group discussion provided a range of personal perspectives on issues which needed to be addressed in a review of the local procedure. Discussion included the need to ensure that any procedure did not unduly restrict Incident Controllers from deploying resources as determined by identified priorities. Also, there was concern that the current procedure could not be easily applied practically at all buildings, which meant that it was not being properly implemented. Participants also raised the issue of the Discussion Paper (Appendix C) on the potential for reducing initial attendance to unconfirmed private fire alarm calls. While most agreed on the logic behind such a proposal it was felt that any multi storey building procedure had to allow for varying levels of initial response to ensure seamless integration of further arriving appliances should the incident be upgraded to a greater alarm. Finally, participants were asked for their thoughts on what should constitute essential components to be included in a SOP. This discussion assisted in drafting the Chief

Fire Officer survey and influenced the first draft of the Auckland Region Multi Storey Building Procedure (Appendix H).

The results of the survey question on essential components of a SOP (Chart 2) placed high importance on issues such as lift use, command and control structure, ventilation, breathing apparatus control, fireground facilities such as Lobby Control and logistical issues such as stairwell management and resource assembly. The major subject headings and sub headings, listed in Figure 1, included in the first draft addressed many of the more significant topics which Chief Fire Officers wished to be considered in the SOP.

Chart 2

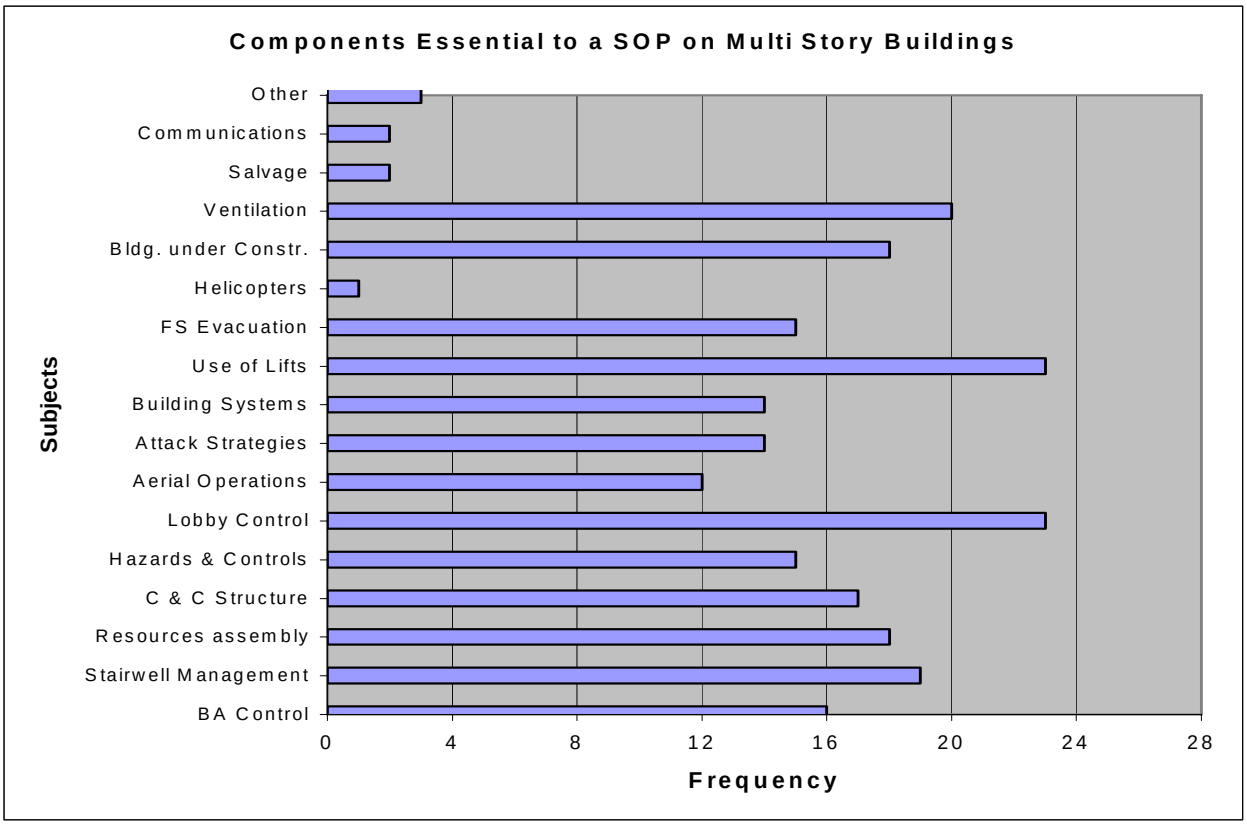


Figure 1 Draft SOP Headings

Overview
Part 1 – Introduction
- Objective
- General

Part 2 – Command & Control
- Incident Structure
- Senior Officer Actions

Part 3 – Fireground Facilities
- Incident Control Point
- Lobby Control Point
- Safe Forward Point
- Forward Staging Area
- Staging Area
- Assembly Area
- Stairwell Support
- Incident Layout

Part 4 – Firefighting Procedures
- Predetermined Attendance
- Initial Response Crew Duties
- Greater Alarms
- Fire Attack Strategy
- Use of Stairs
- Vertical Fire Spread
- Safety Consideration
- Building Evacuation
- Fire Service Evacuation
- Salvage

Part 5 – BA Control
- Initial Attack – BA Crews
- BA Entry
- Entry Control
- Phase II BA
- Long Duration BA

Part 6 – Lifts
- Lift Use
- Firefighters Lifts
- General

Part 7 – Building Systems
- Riser Mains/Fire Hydrant Systems
- Fire Control Rooms
- Heating, Ventilation & Air Conditioning (HVAC)

Part 8 – Buildings under Construction
- NZ Standard
- Safety

DISCUSSION

The intent of this research project was to create a procedure for fire service operations at multi storey buildings based on what other departments had learned from their experience in fighting these types of fires. In addition, a review of published operating procedures of four significant fire departments in the United States was also undertaken to provide some understanding of contemporary best practice with regard to high rise operations. The suggestion (USFA, 1999), that other fire departments' operating procedures can be an excellent source of information and that there are few unique problems in emergency response proved very true in this instance. The significant depth and breadth of the operating

procedures reviewed served to demonstrate the importance these fire departments placed on ensuring they were prepared for a high rise fire. This accentuated the need for a review of the Auckland Fire Region's operating procedure and served as a warning that to be effectively implemented the procedure must be regularly tested in the field.

The literature review confirmed the complexity and logistical challenges inherent in even a moderate sized high rise fire. As Routley (report 082) emphasised, "tasks that are normally considered routine for most fire departments become very difficult in highrises". The review of three of the more significant high rise fires that have occurred in recent years graphically illustrated the commonality of key lessons learned. The myth of the fire proof high rise building must surely be just that, a myth. No fire department should become complacent in the false assumption that the construction and fire suppression features of the modern high rise building will contain and limit fire spread until the arrival of the fire service. As Dunn (1995) suggests, we can no longer rely on high rise construction to stop fire spread. The experiences of the three significant high rise fires selected for review clearly demonstrate this.

The recurring theme of the benefits of sprinkler systems in high rise buildings was supported during the discussion that took place as part of the focus group looking at high rise operational issues. The presence of a sprinkler system in a high rise building is the most effective means of fire suppression in support of the fire department's operational strategy. It became apparent during the research phase that the Auckland Fire Region operates in a high rise environment with a more stringent building code requirement with regard to sprinklers than might be found in other jurisdictions which have experienced high rise fires. This is one of the reasons why the NZFS is currently contemplating a reduction of initial response attendance to unconfirmed private fire alarm system calls. Considering the extremely small percentage of calls that are actual fires requiring fire service intervention (little more than

1%, see Appendix C) this strategy seems appropriate in terms of a purely risk based approach to resource allocation. For every fire appliance responding to a high rise false alarm there is one less available to attend a real fire emergency if required.

It was interesting to note that a significant majority of Chief Fire Officers taking part in the survey chose to define a multi storey building using a minimum number of floors as their criteria and that the height was relatively low (the majority chose either three or four floors for their definition). Only one of the four large US department operating procedures reviewed included a specific definition for high rise buildings, and that was based not on any particular height but referred to buildings that "lacked viable exterior access to the upper floors for firefighting" (Pittsburgh Bureau of Fire, 1992). Other definitions tended to focus on the height of the building in comparison to the department's tallest aerials or ladders (Dunn, 2000a). It is possible that the New Zealand Chief Fire Officers rationale for their chosen definition is that historically the definition centred on whether the building had a riser fitted or not. Under a previous standard (NZ Standard 1900, chapter 5) risers were required for all buildings over twenty five metres in height, which roughly equated to eight floors. However, there was also a recommendation from the New Zealand Fire Service Fire Safety Department that owners of buildings four floors or more in height were strongly recommended to install a riser system. Perhaps the final chosen definition is academic as what matters most is that Incident Controllers have the ability to implement the Multi Storey Building procedure at any fire in a multi level building if they believe by doing so operations will be more effective.

There were a number of issues identified that firefighters need to be aware of when managing high rise fires and to a large extent these have been included in the draft procedure (Appendix H). However, there were four primary areas which Chief Fire Officers strongly indicated should be included in a local procedure. As stated in the literature review there is a

necessity to have an organised and structured approach to command and control at a high rise fire. Gerard (1981) argues, using the Los Angeles Fire Department as an example, that an incident command system must promote effective organisational control "through the assignment of specific duties to specific people and by allowing flexibility for organisational growth if the fire incident escalates". The New Zealand Fire Service applies such an incident command structure in the form of the Coordinated Incident Management System (CIMS). CIMS is an integrated multi agency command and control system adopted by the NZFS. The challenge will now be to ensure the command system functions effectively given the greater complexity and logistical challenges that a high rise fire presents. Despite the inclusion of an organisational chart in the draft procedure (Appendix H) there were command and control issues apparent during the third alarm exercise. Further discussion and testing is required to ensure that all officers have an agreed understanding of the practical implementation of the CIMS model at a high rise incident.

Another important issue was how the incident ground is physically structured. What facilities need to be established, where they should be located and what the roles and responsibilities of those who staff them are? All four of the fire department procedures reviewed gave considerable space to detailing the various fireground facilities such as Command Post, Lobby Control, Forward Control, Staging and Base among others. The San Francisco procedure discussed the issue of a resource called "position packets" which "contain the necessary information, checklist, forms and supplies required for the execution of the assigned functions" (SFFD, 1999). The Auckland Region is already developing general resource kits for senior officers which will enable them to more effectively manage specific fireground functions and facilities such as Lobby Control and Safe Forward Point. Further examination of the SFFD position packets may further influence this related project. It was considered important to include in the procedure some sort of diagrammatical

representation of how a multi storey building incident might be physically structured. This provides operational personnel with a similar mental model of where various fireground facilities should be located and how they interrelate.

One of the most contentious issues of high rise firefighting is that of the use of lifts during a fire. The literature review served only to reinforce that such a practice is indeed fraught with danger and that there have been many instances of firefighter injury or death as a direct result of this practice. As Leihbacher (2003) contends "even though fire service override systems can make elevators safer, the use of elevators by fire service personnel at high rise fires is inherently hazardous". Responses from NZFS Chief Fire Officers surveyed indicated that some sort of instructional guidance in the procedure regarding lift use for firefighters was a priority. Although it is interesting to note that this result was not supported by CFOs indicating that they considered lift use to be have a relatively low potential for being hazardous for firefighters. Of course the irony is that there have also been recorded instances where lift use by firefighters and building occupants during a high rise fire resulted in lives being saved. The height and complexity of modern multi storey buildings means that firefighters now have to consider the use of lifts if they are to arrive at the fire floor in an appropriate time and condition to be able to do any good. Officers must have a good knowledge of lift operating systems to be able to make sound risk-based assessments before committing personnel into a lift. The argument of whether a general rule can be applied not to use lifts at all will continue beyond this research project.

Finally, the related issues of building ventilation and stairwell management also featured high on the list of concerns which NZFS Chief Fire Officers wanted addressed in a SOP. The impact tall buildings can have on fire and smoke behaviour was well covered in both the literature and SOPs reviewed. Features such as poke-through construction, large plenum areas, stairwells, lift shafts and HVAC systems can all affect the travel of fire and

contaminants within a building" (LAFD, 1995). It is imperative that officers understand the principles of smoke behaviour and the practice of ventilation in multi storey buildings. The increasing sophistication of building systems means that it is important that fire officers gain specialist engineering advice as soon as possible at a fire. This will help to ensure that the best possible use is made of the inbuilt systems to manage smoke travel and aid ventilation. The suggested procedure of using one stairwell kept clear of smoke for evacuation purposes, and the other for use by firefighters is not always an easy option. Human behaviour of occupants may mean that directing them to a particular stairwell or requesting them to remain in place might not be successful. Compounding the problem, firefighters may not have the luxury of having a choice of stairwells. There is growing concern among personnel in the Auckalnd Region Fire Safety Department at the number of multi storey apartments being built with only a single means of escape. This is an important issue that will need to be expanded on in a future review of the multi storey building procedure.

In conclusion, there were many issues which firefighters need to be cognisant of during high rise operations. Whilst personnel in the New Zealand Fire Service may not have the same practical experience of high rise firefighting there is still a good level of awareness of the complexities involved in managing such incidents. This level of awareness and concern became apparent during the focus group discussion, the Chief Fire Officer survey and subsequent discussions during the procedure drafting process. The results of this project will ensure that the issue of effectively managing multi storey building fires will remain at the forefront of peoples' thinking during the ongoing review and redrafting process. Upon completion of the final procedure there will be an organisational need to regularly practice the procedure and to encourage operational staff to undertake significant pre-planning regarding their local high rise hazardscape.

RECOMMENDATIONS

The requirement for the Auckland Fire Region Commander and Auckland Chief Fire Officers to develop and promulgate a local SOP for operations at multi storey buildings is clearly required by the National Commander (See Appendix B). While the Auckland Fire Region currently has such a procedure it is considered to be out of date with current practice and will not be able to be implemented should predetermined responses be reduced. It was the intent of this research project to review international practice and lessons learned in conjunction with local experience to assist in developing a draft SOP for multi storey buildings. This procedure would also include an agreed organisational definition for a multi storey building for fire service purposes.

It is the recommendation of this report that the draft local procedure (Appendix H) is distributed amongst the Auckland Region Chief and Deputy Chief Fire Officer group for comment and feedback. Inherent in this process is the need to recognise that predetermined responses to unconfirmed private fire alarms in multi storey buildings may be reduced in the future. This will require that any multi storey building procedure is flexible enough to enable Incident Controllers to determine priorities and deploy personnel and resources to effectively manage any risk irrespective of what the level of a first alarm attendance might be. This does not preclude Incident Controllers from requesting additional resources upon confirmation of a fire or if they determine the building or its occupancy is of a high risk nature.

Upon completion of the Chief Fire Officer feedback process any redrafted procedure should then be made available to all operational officers in the Auckland Fire Region for comment and feedback. This will ensure a robust peer review process is carried out and that any issues or implementation problems have been identified. At the completion of this feedback process a small committee representative of operational and management personnel should then be formed to make any necessary changes to the procedure before a final draft is

again practically tested by means of a third alarm exercise. Any implementation problems determined during the exercise shall be reviewed and redrafted before a final version is promulgated and adopted by the Region. It would also be prudent to undertake a further review of the procedure some 12 months after its introduction to determine if there are any ongoing issues requiring modification to make the procedure more operationally effective.

It is further recommended that the final version of the Auckland Fire Region Multi Storey Building Local Procedure is adapted to meet the requirements of the national multi storey building procedure. This will help to ensure that the national document is of sufficient detail to become more operationally relevant and valuable to officers outside the Auckland Region as well as ensuring a better alignment in terms of philosophy and content between the two documents.

Finally, considering the emphasis placed on pre-fire planning in many of the articles and reports researched for this project it is strongly recommended that the Auckland Fire Region embark on a comprehensive and systematic multi storey building planning and familiarisation process. This should be conducted by operational personnel generally expected to respond to this type of risk and incorporate a documented register and risk assessment being undertaken for all buildings meeting the multi storey building definition criteria.

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APPENDIX A

Background on the New Zealand Fire Service and the Auckland Fire Region

The New Zealand Fire Service (NZFS) is a national fire service delivering emergency response services, technical and legislative fire safety advice and community fire safety education to the public and other stakeholders of New Zealand. The country is a relatively small South Pacific nation with a predominantly European based population of approximately four million people.

The NZFS employs approximately 1600 fulltime career firefighters primarily deployed in the metropolitan cities and larger towns. In addition, there are around 8,000 volunteer firefighters servicing the provincial and rural sectors. A government appointed entity called the New Zealand Fire Service Commission governs the NZFS. The Commission is responsible to a Minister of the Crown for the strategic outcomes of the NZFS. Within the NZFS there is a Chief Executive who is responsible for day-to-day management and appointments of all other Fire Service personnel. The Chief Executive also holds the position of National Commander. The National Commander is the operational head responsible for the prevention, suppression and extinction of fires, and the safety of people and property endangered by fire. The annual operating budget for the 2003-04 financial year is $NZ213m.

The NZFS is made up of eight, geographically distinct Fire Regions. The Auckland Fire Region provides services to the largest city of New Zealand. Auckland comprises a metropolitan city, urban, suburban and rural areas and covers approximately four and a half thousand square kilometres with a population of approximately 1.3 million people. Operational personnel within the Region respond to over 7,000 emergency calls per year.

The Auckland Region is comprised of five career fire districts, each with its own Chief and Deputy Chief Fire Officers. While the districts operate as distinct, statutory declared districts, they also conjointly operate under the wider administration of the Fire

Region. The Region has a paid firefighter establishment of 540 staff covering twenty six fire stations. In addition, there are twenty six volunteer brigades with approximately 700 members. The Auckland Fire Region annual operating budget for the 2003-04 financial year is $NZ44m.

The primary multi storey building risks within the Auckland Region are situated in the central business district of downtown Auckland. Multi storey buildings range from low rise office and commercial premises to large commercial and apartment buildings in excess of 40 floors. In addition, the tallest tower in the southern hemisphere, the Sky City Casino and Tower looms large on the Auckland skyline. The tower is a significant multi storey building with a height measured at 328 metres (1076 feet).

APPENDIX B

Current NZFS national Multi Storey Building Procedure

26 Multi-Storeyed Buildings

National Commander Instructions

Purpose

To provide for safe and efficient operations at incidents involving multi-storied buildings.

Related Topics:

- 26.1 Instructions for Multi-Storeyed Buildings
- 26.2 Hazard Identification and Control: Fighting Fires in Multi-storeyed Buildings.

26.1 Instructions for Multi-Storeyed Buildings

National Commander Instructions - Multi-Storeyed Buildings

Contents:

See also:

- [NCI] 26 Multi-Storeyed Buildings
- [NCI] 26.2 Hazard Identification and Control: Fighting Fires in Multi-storeyed Buildings

Chief Fire Officers' and Fire Region Commanders' Obligations

The Chief Fire Officer must issue a procedure for managing incidents in multi-storied buildings when such a procedure is relevant to the fire district. The Fire Region Commander must ensure that, if relevant, every fire district in the fire region has a procedure in accordance with this instruction.
A multi-storied building is any building with more than three floors.

Operations

The procedure must include:

- the response and availability of firefighting resources

- appliance parking
- greater alarms
- command and control
- breathing apparatus control
- riser procedure
- control points and/or staging
- the use of helicopters.

Building Facilities

The procedure must also include instructions on the use of:

- fire control centres
- lifts
- staged evacuations
- ventilation/air conditioning.

Buildings Under Construction

Buildings under construction present different problems and should be specifically provided for in the procedure.

26.2 Hazard Identification and Control: Fighting Fires in Multi-storeyed Buildings

National Commander Instructions - Multi-Storeyed Buildings

See also:

- [NCI] 26 Multi-Storeyed Buildings
- [NCI] 26.1 Instructions for Multi-Storeyed Buildings
- [NCI] 1.1 Instructions for Operational Safety
- [NCI] 4 Breathing Apparatus

Hazard Identification and Control: Fighting Fires in Multi-storeyed Buildings

Hazard control

All hazards must be controlled by eliminating them, isolating them where elimination is impracticable, or minimising them, using one or more of the control methods given below.

Fighting fires in multi-storeyed buildings

Tasks	Hazards	Control measures	Health and Safety Regulations Codes of Practice Standards
Firefighting	***See National Commander's Instruction Manual Topic 1.1***	• *All personnel must be trained in the conditions that may be encountered, and the safe practices required, when working at fires in multi-storeyed buildings* • *Use local operating procedures for multi-storeyed buildings* ***See National Commander's Instruction Manual Topic 1.1***	
Wearing BA	***See National Commander's Instruction Manual Chapter 4***	***See National Commander's Instruction Manual Chapter 4***	
Using lifts	***Significant hazards:*** • *Lift stopping at fire floor or other malfunction*	• *All personnel must be trained in the conditions that may be encountered, and the safe practices required, when working at fires in multi-storeyed buildings*	
Falling debris	***Significant hazards:*** • *Being hit by debris*	• *All personnel must wear structural fire fighting uniform* • *A safety cordon must be established around the building* • *Personnel from other services must wear suitable protective clothing when working within cordoned area*	
Buildings under construction ; renovation and demolition	***Significant hazards:*** • *Holes in floors* • *Unexpected fire spread* • *Dry risers not having an air valve*	• *All personnel must be trained in the conditions that may be encountered, and the safe practices required, when working at fires in multi-storeyed buildings* • *Maintain secure escape routes* • *Bleed air from riser before connection deliveries* ***See National Commander's Instruction Manual Topic . 1.1***	

APPENDIX C

Summary and Recommendations from Discussion Document on Private Fire Alarm Response.

EXECUTIVE SUMMARY

The New Zealand Fire Service commits substantial resources responding, on average; to over 11,000 Private Fire Alarm (PFA) calls per year. Analysis of FIRS statistics confirms that the vast majority of PFA calls turn out to be false alarms. A consistently high percentage of these calls (98.8%) do not require the Fire Service to intervene in terms of extinguishing a fire. Of the calls that do require Fire Service intervention the majority are small fires that are quickly extinguished.

This report recommends that when an alarm activation is received without additional information indicating that a fire has occurred, such as a supporting 111 call, the Fire Service treats it as an investigation call and responds a single appliance. This response would still provide effective intervention in the case of discovery of a fire as research indicates that the fire is most often likely to be small and easily extinguished.

It is also recommended that a risk assessment process be applied to determine the appropriate response to unsubstantiated Private Fire Alarm calls that the Chief Fire Officer considers require more than a single pump response. These will become the National Commanders Guidelines to assist districts to determine an appropriate level of response to this type of call.

This process offers a cost-effective method of discharging the Fire Services responsibilities to Private Fire Alarm clients while maintaining the optimum use of operational resources. This can be achieved without restricting the ability of first arriving appliances to enhance the response if there is an indication that a fire is evident.

RECOMMENDATIONS

- The Fire Service should regard all unsubstantiated PFA calls as investigation calls only.

- The acceptable standard response to unsubstantiated PFA calls will be one appliance. This standard response will be enhanced if a risk analysis of the premises indicates the need. In this instance an appropriate PDA will be developed, which will usually be a two-pump response.

- A 1st alarm response should be dispatched by the Communications Centre when any of the following occurs:
  - There is a confirming 111 call reporting a fire in the building, or
  - A telephone call on a fire station or Communication Centre business line reports a fire in the building, or
  - A PFA call is received from a building with the sprinkler system out of commission for maintenance, or
  - Two separate PFA calls are received for the same building, or
  - An allied emergency service reports a fire in the premises.

- Local procedures (such as High Rise and Rest Homes Procedure) should only be implemented when there is a confirmed fire in the building. Operating Procedures will need to be amended to reflect this change in policy.

- The Fire Service should conduct a communication programme for external and internal stakeholders regarding changes to responses to PFA calls.

- A small team is tasked with preparing an implementation plan.

- The Fire Service should continue the work to reduce the incidence of PFA generated false alarms.

APPENDIX D

Multi Story Building Standard Operating Procedures Questionnaire

To: Chief Fire Officers/Deputy Chief Fire Officers

I am undertaking a review of our national standard operating procedures for multi story buildings in conjunction with an external research project.

The following questions seek your opinions regarding operations at multi story buildings in your District/Region. Names of individual respondents to this survey will not be published in the final report only the total sample responses will be included.

Instructions:
Where there is a "check" box next to an answer selection please place the cursor directly over the box and double click. A dialogue box will open. To insert a cross in the box select **Checked** in the **Default value** section of the dialogue box. Where an answer requires a typed response just type in your answer adjacent to the question.

Once completed please save and return your questionnaire by **forwarding** the e-mail and associated attachment back to Russell Wood (NB: returning the e-mail by reply to sender won't include the attached file). If you experience problems in the above response process then please feel free to return a completed hard copy to:
PO Box 68 646
Newton
Auckland

Thank you for your participation in this survey.

Q 1. Does your District or Region currently have a local SOP for multi story buildings in place?

YES ☐

NO ☐

Q 2. Do you consider that your District/Region has a multi story building risk(s) within its boundaries?

YES ☐

NO ☐

Q 3. Has your District or Region experienced a multi story building fire within the last 10 years?

YES ☐

NO ☐

Q 4. The current NCI for multi story buildings defines a multi story building as any structure of three or more floors. What do you consider to be an appropriate definition for a multi story building to be included in a SOP?

☐ a specified number of floors. State how many floors: --
☐ a specified height measured in metres. State how many metres:--
☐ whether or not a riser system is fitted in the building
☐ when the building is taller than a particular type of NZFS ladder or aerial appliance
state which type:--

Q 5. What do you consider should be the **minimum** Fire Service pre determined attendance to a private fire alarm or any other unconfirmed call to a multi story building?

Appliances	**Number of**
Pumps	1☐ 2☐ 3☐ 4☐
Aerials	1☐ 2☐
Other	Specify:

Q 6. What do you consider to be the role (if any) of aerial appliances at a confirmed fire in a multi story building?

Type answer here:

Q 7. What do you consider to be the greatest potential hazards to firefighters when conducting operations at a multi story building? Please indicate your **top 3** by checking the adjacent box.

☐ Uncontrolled vertical/horizontal fire spread
☐ Falling debris
☐ Lift operations
☐ Firefighter disorientation due to size/complexity of building
☐ Aerial operations
☐ Building collapse
☐ Being trapped above fire floor
☐ Plant rooms, lift rooms, electrical hazards etc
☐ Firefighting above the fire floor
☐ Other (please specify):

Q 8. What are the components you consider essential for inclusion in a national SOP for multi story buildings. **Only select those you consider necessary.**

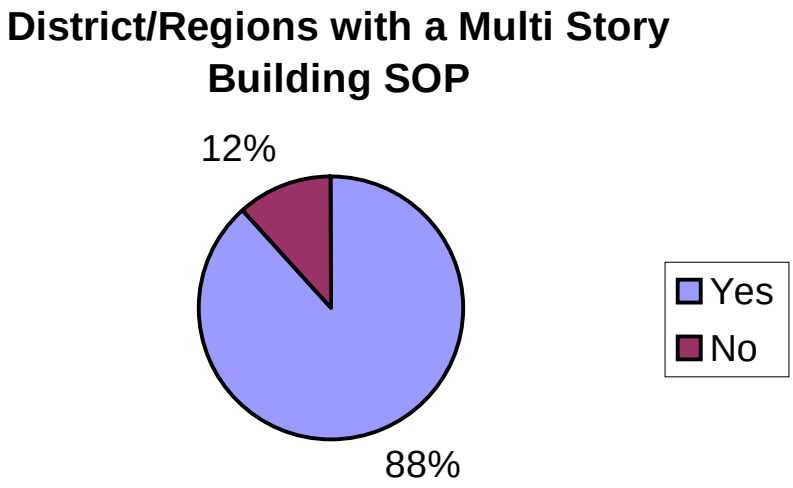
☐ BA control procedures
☐ Stairwell management
☐ Fire Service resources assembly
☐ Command & control structure
☐ Potential hazards and their control
☐ Lobby Control
☐ Aerial appliance operations
☐ Fire attack strategies
☐ Building and fire detection/suppression systems
☐ Use of lifts
☐ Fire Service evacuations and emergencies management
☐ Helicopters
☐ Buildings under construction
☐ Ventilation
☐ Salvage
☐ Other (please specify):

THANK YOU FOR TAKING THE TIME TO COMPLETE THIS QUESTIONNAIRE

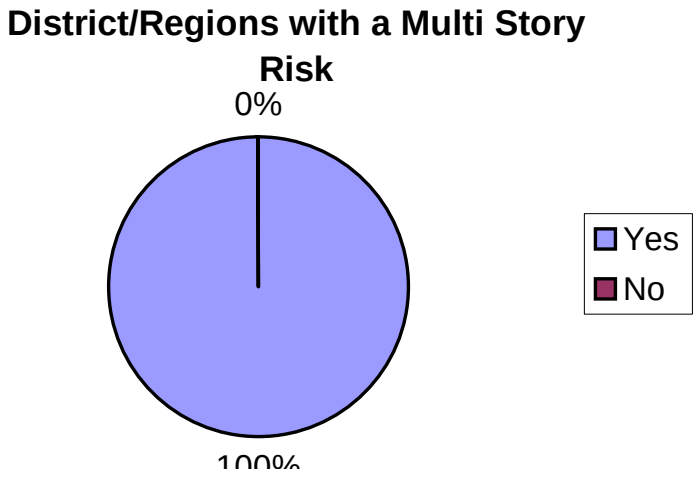
APPENDIX E

Survey Results

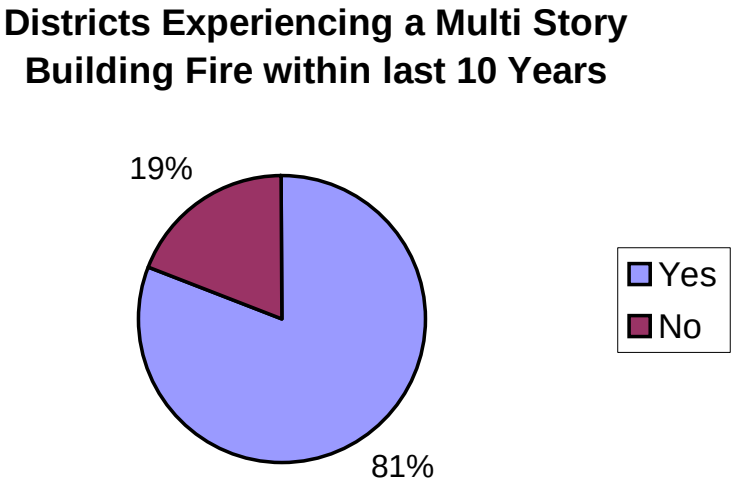
Question 1: Does your District or Region currently have a local SOP for multi storey buildings in place?
Chart 1



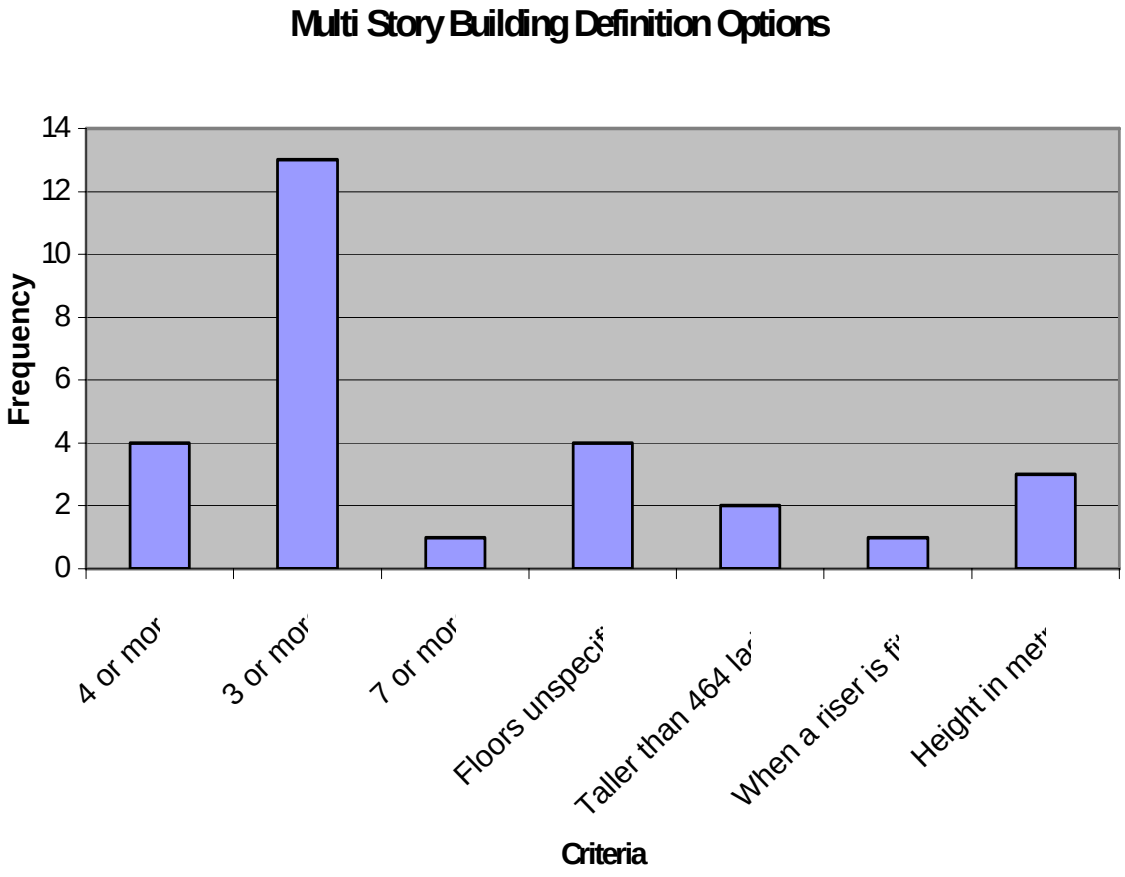
Question 2: Do you consider that your District/Region has a multi storey building risk(s) within its boundaries?
Chart 2



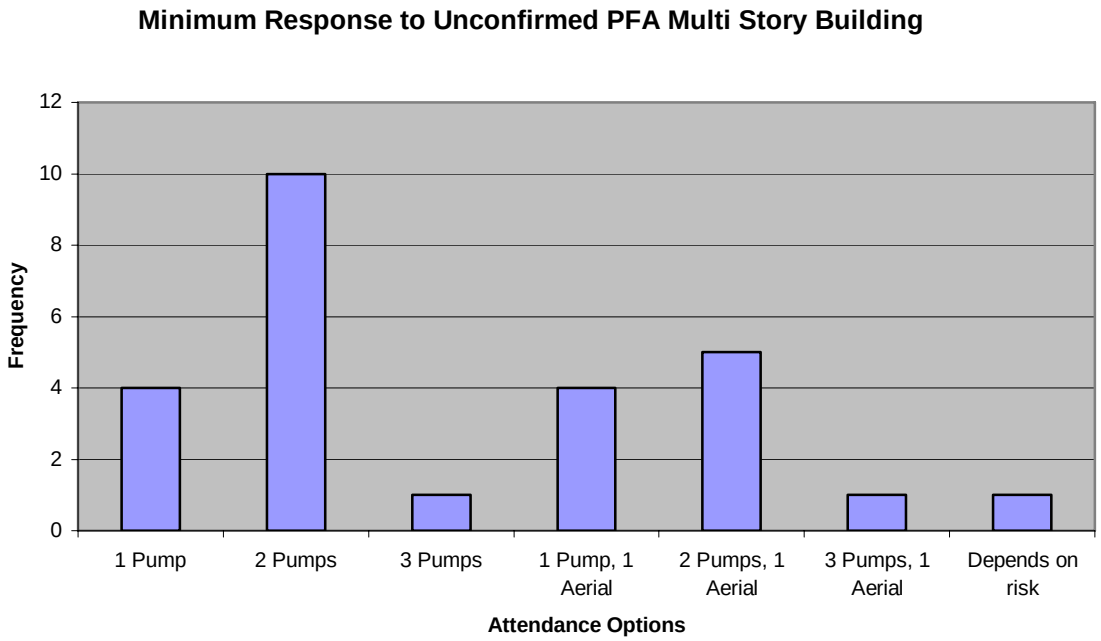
Question 3: Has your District or Region experienced a multi storey building fire within the last 10 years?
Chart 3



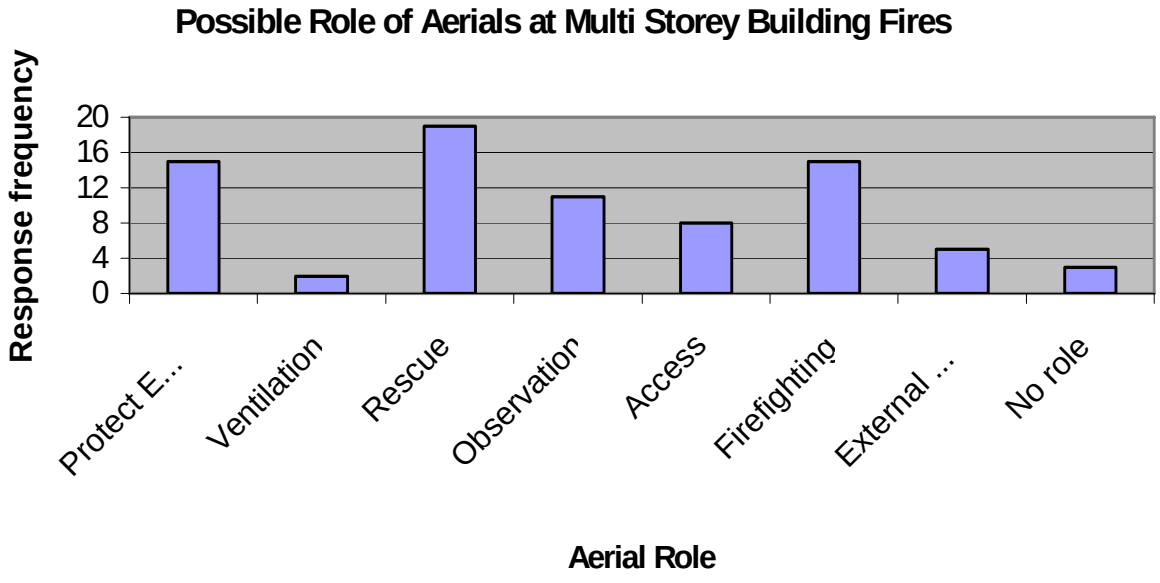
Question 4: What do you consider to be an appropriate definition for a multi storey building?
Chart 4



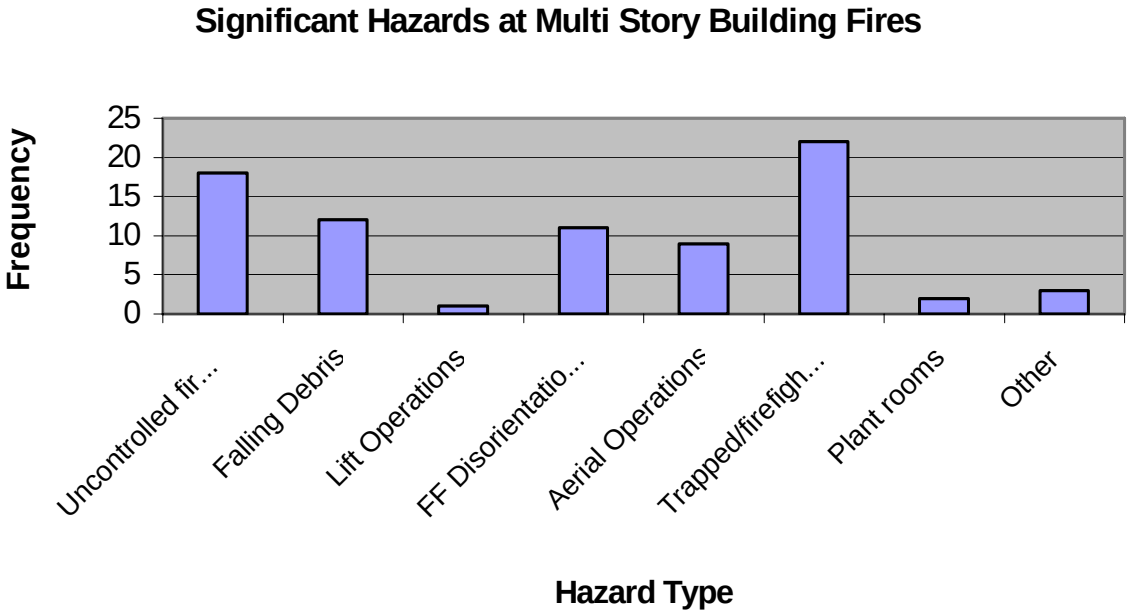
Question 5: What do you consider should be the Fire Service response to a private fire alarm, or any unconfirmed call to a multi storey building?
Chart 5



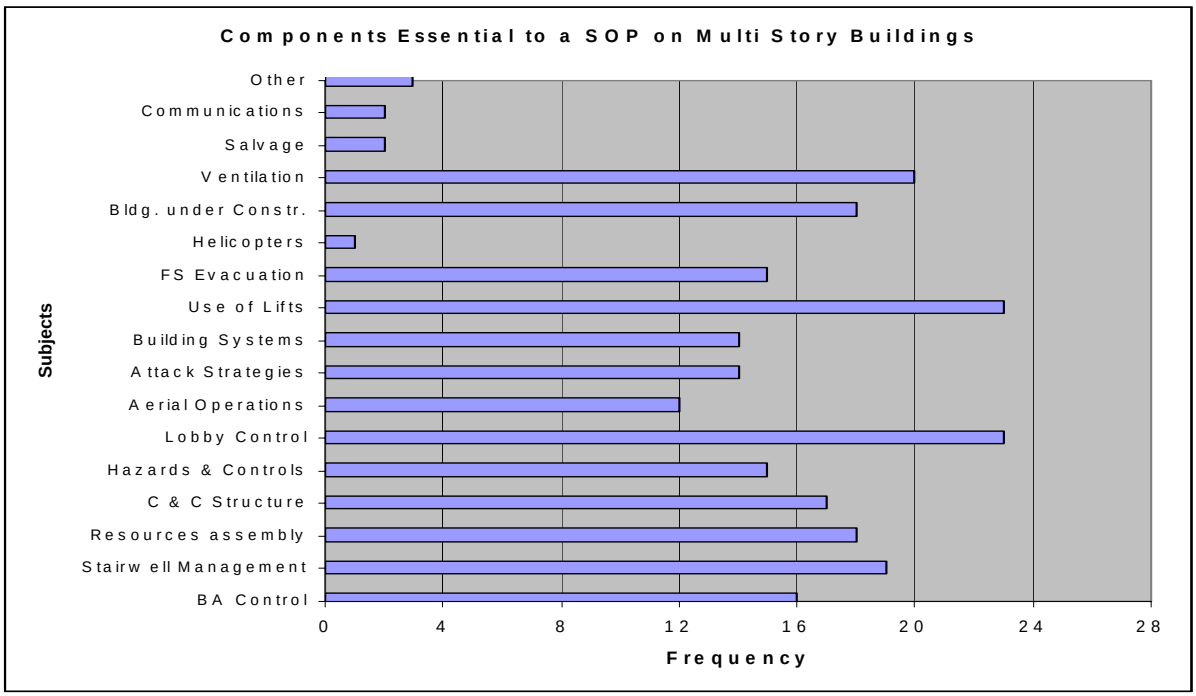
Question 6: What do you consider to be the role of aerial appliances at a multi storey building fire?
Chart 6



Question 7: What do you consider to be the greatest potential hazards to firefighters at a multi storey building fire?
Chart 7



Question 8: What do you consider essential for inclusion in a SOP on operations at multi story buildings?
Chart 8



APPENDIX F

Multi Storey Building Exercise Details(18/01/04)

A third alarm multi storey building exercise is to be conducted in the Auckland City Central Fire District on 18 January, 2004.

Location: 189 Hobson St., City.

Building: Stanford Apartments (12 storey building under construction).

Objective: To test the new draft Multi Storey Building SOP
To trial prototype Senior Officer Command resource kits and jackets
To practice generic multi storey building operations and activities

Hazards: building under construction, holes on floor, limited stairwell barriers, trip hazards, incomplete partitioning, scaffolding, no exterior walls in places.

Exercise organiser: DCFO R Wood

Senior Officers attending: CFO B Edwards, CFO D O'Donoghue, DCFO M Binning, Operational Planning Officer R Breeze, BA & Equipment Manager R Taylor

Briefing: An initial briefing will be conducted for all officers at City Station commencing at 0900 hrs.

Attendance: As per a full third alarm attendance to this address.

1st alarm: City 207
Ponsonby 261
Parnell 251
Balmoral 611
City 206 (TTL)
Parnell 256 (TTL)

2nd alarm: Remuera 211
Birkenhead 821

3rd alarm: Takapuna 801
Ellerslie 277
Mt Roskill 621
Avondale 601
City 2015 (BA Tender & Control Unit)
Canteen Unit and Fire Police

Cover moves: To be confirmed on the day in conjunction with the Communications Centre Supervisor.

APPENDIX G

Multi Storey Building Exercise Photographs

Image 1: Incident Control Point Established

Image 2: Lobby Control Point Board

Image 3: Lobby Control Point established

Image 4: Safe Forward Point being established

Image 5: Congestion at Safe Forward Point

Image 6: Patient rescue from fire floor

Image 7: Aerial appliance operation

Image 8: Breathing apparatus entry control established

APPENDIX H

Multi Storey Building – Draft Local Procedure

Auckland Region

Local Procedure

Multi Storey Building Procedure

Document Title: **Multi Storey Building Procedure No 26**

First Published: **09 January 2004**

Staff having recommendations for change to contents or layout should notify:

PO Box 68444
AUCKLAND

Ph: 09 302 5100
Fax: 09 302 5130

ISSUED:

Table of Contents

Multi Storey Building Procedure
Operational Procedure No. 26 (DRAFT)
Overview

Definition

A Multi Storey Building is a building of 4 or more floors, or a building that has a riser / hydrant system fitted.

Introduction

Whenever the NZFS attends an incident in a "Multi Storey Building", this operational procedure shall be put into effect.

Sections

The operational procedure is broken down into the parts listed in the table below.

Multi Storey Building Procedure
Operational Procedure No 26 - Part 1
Introduction (DRAFT)

Overview

In this section The following Topics are included in this section.

Introduction

Introduction

This "Multi Storey Building Procedure" is divided into sections that cover the procedures required to be implemented during multi storey building fires. They are:

Part 1. Introduction
Part 2. Command and Control
Part 3. Fireground Facilities
Part 4. Firefighting Procedures
Part 5. Breathing Apparatus Control
Part 6. Lifts
Part 7. Building Systems
Part 8. Buildings Under Construction

Objective

Objective

The objective of this Standard Operating Procedure (SOP) is to provide officers with essential information necessary to fulfill the duties of their position and to clarify and define operational practices essential for the successful extinguishment of fires in multi storey buildings.

It is acknowledged that conditions will develop in fire fighting situations where a basic standard operation will not always be applicable. Therefore, initiative and ingenuity of officers is necessary in overcoming the complexities that exist under actual fireground conditions. All operations must be implemented within the philosophy of the NZFS Safe Person Concept.

Definition

A Multi Storey Building is a building of 4 floors or more, taken from the lowest point of Fire Service access or a building in which a hydrant system/riser main has been fitted.

General

Exceptions

A building built prior to the adoption of current standards may not have an internal riser main fitted. This procedure shall still be implemented, however, water supplies to upper floors will need to be provided by use of Fire Service equipment.

Incident Controllers may choose to implement this Local Procedure at buildings not defined as Multi Storey Buildings if they believe operations will be enhanced by doing so.

Command & Control

This Local Procedure sets out the general operational procedures that should take effect at every Multi Storey Building incident.

Operational Procedure 3 - Incident Management System, sets out the specific functions for some designated control tasks. The Fire Service chain of command at multiple crew incidents is also described.

Developing fires in Multi Storey buildings require large commitments of personnel and equipment, especially Breathing Apparatus. **Incident Controllers shall not hesitate in requesting a Greater Alarm response if considered necessary.**

Multi Storey Building Procedure
Operational Procedure No 26 - Part 2
Command & Control Procedures (DRAFT)
Overview

In this section The following topics are included in this section.

Command and Control

Command & Control

Fires in Multi Storey Buildings place unique demands upon the fire service. The large floor areas, the height of the building, the large number of occupants and the complex building support systems all require that the fire service establish procedures to command, control and coordinate our operations at fires within these buildings. This Local Procedure sets out the general operational procedures that need to be considered and implemented at every Multi Storey Building incident.

Operational Procedure 3 - Incident Management System sets out the specific functions for designated command and control tasks within the Coordinated Incident Management System. This Multi Storey Building Procedure should be implemented in conjunction with the Incident Management System Procedure. See Chart 1 for a suggested incident management structure for a Multi Storey Building fire.

Pre determined attendance

Pre determined attendance by NZFS appliances might vary depending upon the building type and the results of any pre incident risk assessment undertaken. It is important therefore, that any Multi Storey Building Procedure provide sufficient flexibility for officers in charge to manage the incident based upon the priorities as they determine them and the resources available at the time.

Upgrade to greater alarm

Incident Controllers should not hesitate in transmitting a greater alarm should the situation warrant it. For example, if in attendance at a confirmed Multi Storey Building fire involving a large building with a significant number of occupants then a 3rd or 4th alarm would be appropriate.

Incident Action Plan

The evacuation and rescue of persons within the building and affected by any fire conditions shall be the first responsibility of all Officers.

The Incident Controller at any Multi Storey Building fire should consider it a priority to formulate and communicate a strategy to deal with the incident. Such strategy should be documented at the earliest opportunity by means of an Incident Action Plan (IAP). The IAP should include details on the tactical approach to be employed by crews and any identified hazards and associated mitigation plans.

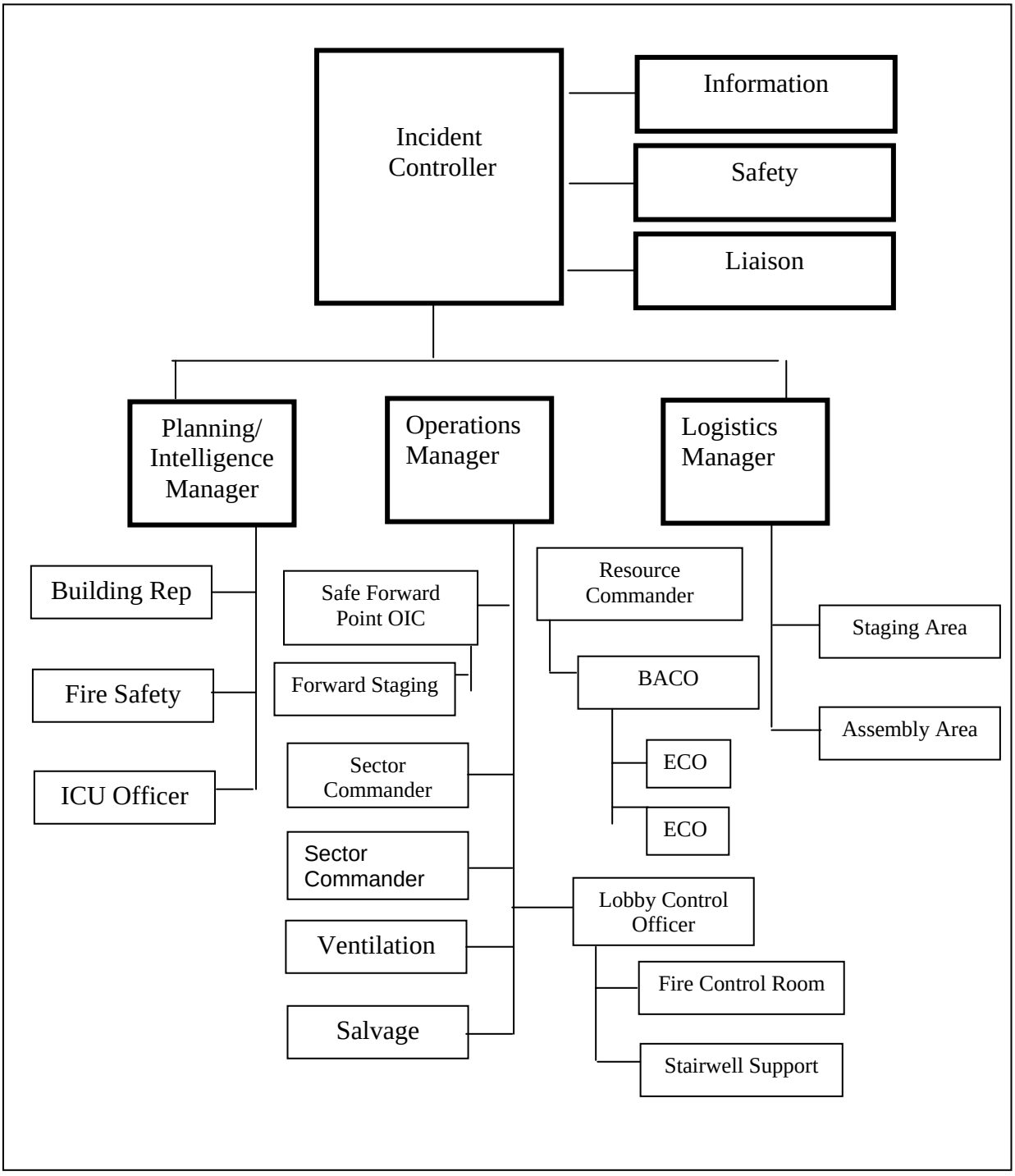
Safety Officer

A designated Safety Officer is to be appointed at all Multi Storey Building fires with a greater alarm attendance or at any time that the Incident Controller deems that operations warrant the appointment of an officer whose sole responsibility is that of fireground safety.

Incident Structure

Chart 1

Multi Storey Building Fire
Incident Structure for a typical greater alarm Multi Storey Building fire



Senior Officer Actions

Senior Officer Actions:

A Senior Officer shall respond to all confirmed working fires in Multi Storey Buildings and shall assume control upon arrival. They shall:

a) Assess the adequacy of personnel, appliances, equipment and procedures to that stage.

b) Ensure that a Safe Forward Point is established.

c) Ensure that a Lobby Control Point is established.

d) Request additional Senior Officer attendance over and above pre determined levels, if necessary.

e) Ensure that an Incident Action Plan is developed and implemented and that the plan incorporates a dynamic risk assessment process as per the Safe Person Concept.

General

Incident Control Unit

On arrival at a Multi Storey Building fire the Incident Control Unit Officer shall immediately shall set up Fire Command in a position as determined by the Incident Controller or in their absence a safe site removed from the potential hazard area of the incident.

Fire Control Rooms

Many modern multi storey buildings now incorporate sophisticated fire detection, suppression and evacuation systems. Overall control of these building features may be undertaken from a designated Fire Control Room usually situated at the main entry level floor or adjacent basement area.

Incident Controllers of multi storey building fires should take every opportunity to utilise the features available in Fire Control Rooms to assist in the management of the incident.

General *continued*

Communi-cations Plan

Fireground communications at greater alarm Multi Storey Building incidents are critical to ensuring safe and effective resource deployment and carrying out tactical operations. It shall be a priority for the Incident Controller to establish and implement a fireground communications plan.

The communications plan should incorporate Tactical, Logistics and Command channels as required. This plan must be communicated to all fireground officers at the earliest opportunity.

Multi Storey Building Procedure
Operational Procedure No 26 - Part 3
Fireground Facilities (DRAFT)

Overview

In this section The following topics are included in this section.

Incident Control Point

Establishment

A designated Incident Control Point (ICP) shall be established at every greater alarm involving a Multi Storey Building fire. This may be by means of a mobile incident control unit or through the use of a fixed facility in the building involved or in an adjacent building, if deemed necessary by the Incident Controller.

Siting location considerations should include ability to control, observation, isolation and safety issues arising from the specific incident involved.

Responsibilities

Fire Command, based at the Incident Control Point shall be responsible for:

- Overall control of the incident through implementation of the Coordinated Incident Management System.
- Fireground communications plan and Fireground to Comcen communications.
- Provision, maintenance and release of resources and coordinates all staff activities.
- Establishment of service functions such as BA servicing, appliance servicing, medical post, canteen, public relations and media.
- Control of staff attending through the Nominal Roll Tally system.
- Identify and maintain an outer safety cordon for the incident.
- Provision of building technical and construction information.
- Maintenance of the ICP log.

Communi-cations Plan

It shall be a priority for the Incident Controller to establish and implement a fireground communications plan. Personnel should be aware of the ability to utilise the building's internal telephone system whenever possible, in order to minimise the level of portable radio traffic.

At any time that crews on upper floors wish to convey information to those on the ground and a portable fireground communications are unavailable they should look for a telephone. By dialing 111 (usually dial 1 first to obtain an outside line) the information can be relayed via the Communications Centre.

Where the building is of a single occupancy, the recording of the extension numbers at SFP, Forward Staging Area and LCP can quickly establish effective, ongoing communications. Similar actions can be taken for BA Control and Entry Control Points where available.

The use of mobile phones by Senior Officers may also enable effective communication without increase hand held radio traffic.

Lobby Control Point

Establishment and Staffing

At a greater alarm involving a Multi Storey Building fire it shall be a priority for the Incident Controller to initiate the establishment of the Lobby Control Point. Responsibility for the implementation of Lobby Control may be transferred to another officer designated by the Incident Controller.

The LCP shall be adequately staffed to ensure the roles and responsibilities are effectively carried out. Incident Controllers should allow **at least one full crew to undertake the Lobby Control function** at a greater alarm Multi Storey Building fire.

Lobby Control shall be set up at ground floor level adjacent to firefighter lifts or stairs and become a supply and dispatch point for the reserves of Firefighters and equipment that may be needed at the Safe Forward Point (SFP).

This area shall be well supervised and well stocked with bulk supplies of all items used in firefighting. At these incidents little use is made of fire appliances themselves so they shall be parked some distance away. Items that are required shall be carried forward to Lobby Control.

LCP Officer duties

The Lobby Control Point Officer reports to the Resource Commander or if not appointed to the Operations Manager and shall control the major functions for:

- Ascertaining the working location and entry points of BA crews already operating within the building.
- Managing the building's fixed facilities by means of the Fire Control Room where available.
- BA Entry Control and relief of initial attack crews.
- Ensuring rescue and evacuation is complete.
- Ensuring riser mains are charged and continue to operate.
- Control and operation of lifts and stairways.
- Organising the movement of firefighters and equipment to the Safe Forward Point and Forward Staging Area as required.
- Controlling entry of all persons into the building and logging all movements of equipment from building.
- Ensuring the safe evacuation of building occupants as required by the Incident Controller.

Lobby Control Point *continued*

Equipment assembly at LCP

The following equipment shall be assembled at Lobby Control Point and transported to the Forward Staging Area in anticipation of being required by fire suppression crews:

- Additional BA sets (complete).
- Spare BA cylinders.
- Additional hose and waterway equipment.
- Forcible entry tools.
- Salvage equipment.
- Ventilation equipment.
- Portable lighting equipment.
- First aid kits and resuscitators.
- Short alloy ladders and preventors.

Fire Control Rooms

Many modern multi storey buildings now incorporate sophisticated fire detection, suppression and evacuation systems. The overall control of these building features may be undertaken from a designated Fire Control Room usually situated at the main entry-level floor.

The Lobby Control Point Officer should ensure that where a Fire Control Room is available that it is staffed by a suitable officer and that the features available in the control room are communicated, and made available to the Incident Controller in order to more effectively manage the incident.

Safe Forward Point

Safe Forward Point (SFP)

At a greater alarm involving a Multi Storey Building fire it shall be a priority for the Incident Controller to initiate the establishment of the Safe Forward Point. The SFP shall be controlled by an Officer appointed by the Operations Manager, or in their absence the Incident Controller.

a) It shall be an area within the building, **a minimum of two floors below the fire floor** (the location below the fire floor may need to be greater depending upon fire conditions at the time and anticipated future conditions), where BA, hosepacks, equipment and personnel are marshalled.

b) Crews shall advance from there to perform actual firefighting and rescue operations.

SFP Officer Duties

The Safe Forward Point Officer reports directly to the Operations Manager and is responsible for the implementation of the firefighting tactics and tasks as determined by the Incident Action Plan. All operations of fire attack, fire spread control; rescue, ventilation and salvage shall be managed via the SFP.

The SFP Officer should undertake the following tasks;

- Obtain briefing and assigned communications channel from the Operations Manager
- Assess situation, evaluate proposed SFP location, and determine immediate needs and request resource deployment to the SFP.
- Establish communications and advise Operations Manager, Logistics Manager, LCP Officer and Forward Staging Officer of location.
- Establish SFP layout and post areas for identification and movement.
- Brief assigned personnel and assign them to functions as required.

In addition to the personnel and equipment being used for current fire suppression operations the SFP Officer shall have available:

- Relief personnel.
- BA recommissioning facilities.
- Spare equipment for that in use.
- Further equipment likely to be used at later stages of the fire.

Forward Staging Area

Forward Staging Area (FSA)

The floor space, or other physical constraints, of the Safe Forward Point may make it impractical or too congested to hold all the relief personnel, equipment and re-commissioning BA in the same location

In such a case a "Forward Staging Area" shall be set up on the next convenient floor below the Safe Forward Point. This Area shall be placed under the control of a designated officer who shall report to the SFP Officer.

Recommissioning of BA, First Aid Station and rehabilitation of relieved personnel, storage of additional equipment are obvious uses of this area.

Staging Area

Staging Area

Available floor space at the Lobby Control Point may make it impractical to hold all the additional personnel and equipment assembled from appliances, which are not yet required at the Safe Forward Point.

The Staging Area shall be set up in a convenient location remote from the building involved in order to protect personnel from falling glass and debris. This will be the location where the primary logistical functions are coordinated and administered. The Staging Area shall be placed under the control of an Officer who shall report to the Logistics Manager and also have a functional liaison relationship with the LCP Officer.

Personnel and equipment from the Staging Area shall only proceed to the Safe Forward Point on the Lobby Control Point Officer's instructions and must pass through the Lobby Control Point in order to be logged as entering the building.

Assembly Area

Assembly Area

The Assembly Area is an area remote from the building where fire appliances and additional equipment not yet required can be assembled prior to deployment to the Staging Area. If required the Assembly Area shall be placed under the control of an Officer who shall report to the Logistics Manager and also have a functional liaison relationship with the Staging Area Officer.

This area is suited for the parking of appliances not utilised, appliance and equipment repair services and for the assembly of other services not immediately required on the fireground e.g. Police, Ambulance etc.

Personnel and equipment from the Assembly Area shall only proceed to the Staging Area on instruction from the SA Officer or the Logistics Manager.

Stairwell Support

Stairwell Support

A fire in a Multi Storey Building requires the commitment of large numbers of personnel and associated equipment. To ensure the required personnel and equipment arrive at the SFP in a timely fashion and in a condition to be deployed effectively it is essential that transportation via the building stairwell(s) is planned and managed effectively.

A designated stairwell for firefighter and equipment transportation is to be determined by the LCP Officer as early as practically possible into the incident.

Stairwell support crews

In a large and protracted incident it may be necessary to designate an officer as the Stairwell Support Officer. This Officer shall report to the LCP Officer and be responsible for efficient movement of firefighters and equipment via the stairwell to the SFP.

Stairwell Support will normally consist of one to two firefighters per two floors moving equipment from the LCP to the SFP. Sufficient personnel shall be deployed at 2 floor intervals between LCP and SFP to ensure the equipment moves as efficiently as possible without unduly fatiguing personnel.

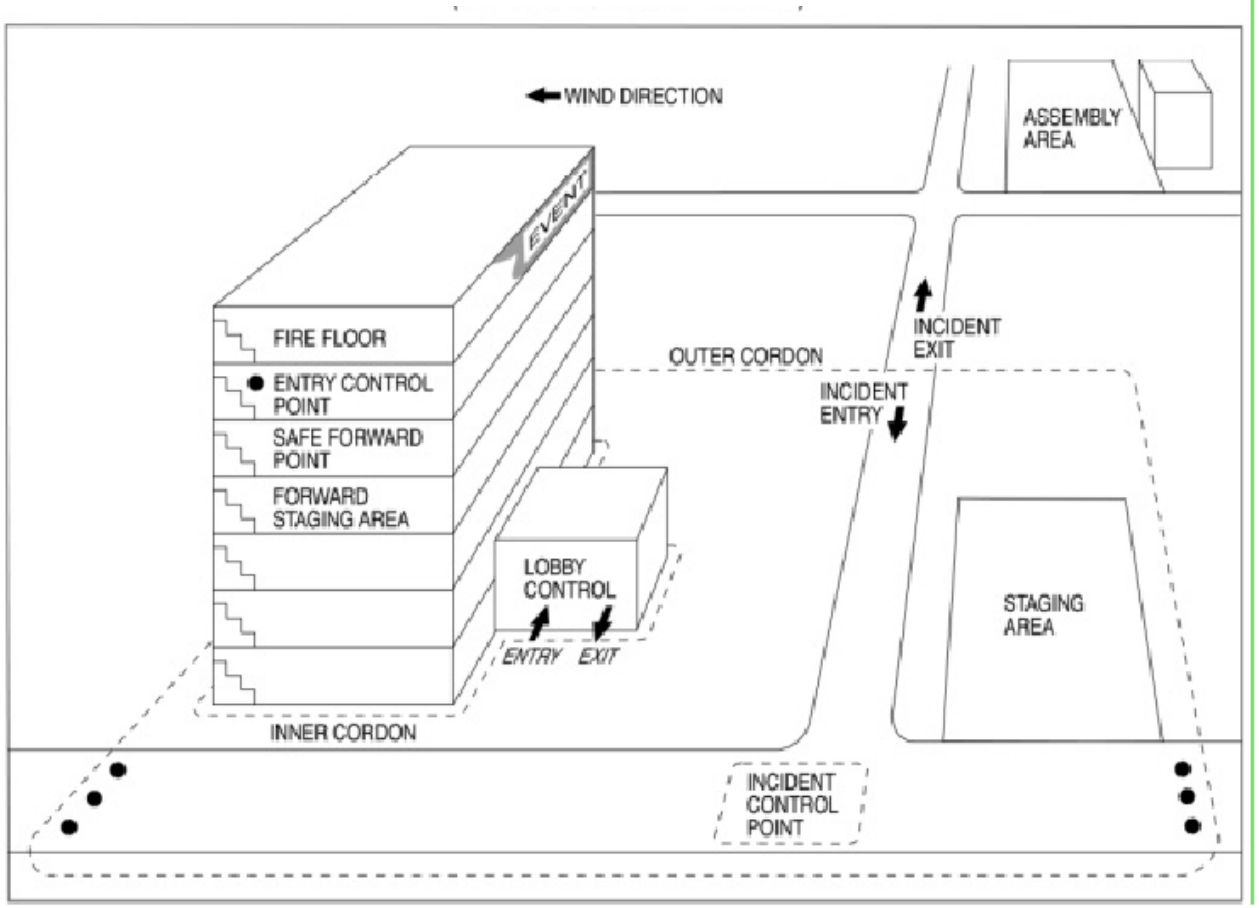
Crews should remove personal protective clothing as appropriate, if stairwell conditions allow, minimising the potential for heat stress. Officers should consider the option for crews to wear their level 1 boots if available on the fireground to reduce fatigue due to climbing stairs in firefighting boots.

Breathing apparatus should be made available to Stairwell Support in the event that the stairwell becomes compromised by smoke. Handheld communications should also be available at strategic levels to enable personnel to report on conditions and the progress of equipment transportation.

The LCP Officer is to monitor the progress of Stairwell Support and call for relief crews as required.

Incident Layout

Typical Multi Storey Building Incident Layout



Multi Storey Building Procedure
Operational Procedure No 26 - Part 4
Firefighting Procedures (DRAFT)

Overview

In this section The following topics are included in this section.

Pre Determined Attendance

Pre Determined Attendance

The response to calls to Multi Storey Buildings will vary depending on the building location and the results of any pre incident risk assessment and resulting pre determined attendance needs.

Where the building has a PFA (and the call is received in that manner) the response will be as determined by the Chief Fire Officer.

Where the building does not have a PFA, or where the call originates by any means other than a PFA, the response will be according to the category of the street or road.

The minimum response to a Multi Storey Building will be two (2) pumps. Where it is considered that the building comprises a special risk e.g. it is not sprinklered, or has a high-risk occupancy type, then additional pumps and or specialist appliances may make up the pre-determined attendance.

Upgrade to greater alarm

Whenever there is smoke or fire showing from any floor in a Multi Storey Building and/or there has been a confirming call (or multiple calls) to a fire in the building, **consideration shall be given to transmitting a greater alarm** either en route, or immediately on arrival, by the first arriving officer.

Priorities & Considerations

The strategic priorities of first arriving crews at any Multi Storey Building confirmed fire can be listed as;
Rescue
Exposure protection
Containment of fire
Extinguishment of fire
Overhaul and salvage

Implicit in this priority list, is the need for officers to determine at an early stage, the location and extent of the fire and the likely resource requirements needed to deal with the incident. Once these have been determined, an assistance message should be transmitted at the earliest opportunity.

Considerations for Incident Controllers should include an assessment of:

a) What is burning?
b) Are occupants endangered and how many are involved?
c) What is the potential for vertical fire extension?
d) What is the potential for horizontal fire extension?
e) What is the best route for personnel and resources going from Lobby Control to the Safe Forward Point?

Initial Response Crew Duties

Initial Incident Control

Before the 1st crew proceeds to the indicated fire floor, they are to wait until the arrival of the 2nd appliance. Upon arrival of this appliance, the Officers will liaise and determine who will be the initial Incident Controller. This will ensure clarity of command and also ensure adequate support for any crew proceeding to the fire floor

The Incident Controller and crew will then assume the responsibility for Lobby Control crew duties, with the other Officer and crew undertaking the role of Initial Attack Crew.

If, for any reason, the arrival of the second responding appliance has been unduly delayed, then the first arriving officer will determine the urgency of proceeding to the fire floor. After carrying out a risk assessment, the Officer may make the decision to proceed to the identified floor, or to remain at the lobby until the arrival of the second crew. Any delayed response to the fire floor should be included in the first Sitrep message transmitted to the Comcen.

If on arrival, the Incident Controller considers that the alarm activation is very likely to have been the result of a false alarm, e.g. confirmation by Building Warden of accidental activation, then the Incident Controller may elect to downgrade the crew size and equipment levels of the initial investigating crew to a **minimum** of an officer and one firefighter.

Where there is **any** doubt as to the validity of the alarm activation, then the full complement of crew and equipment must proceed to the designated floor to fully investigate the alarm activation.

Initial Response Crew Duties *continued*

Initial Attack Crew Duties

The initial attack crew consisting of an Officer and three Firefighters, all with Breathing Apparatus shall:

a) Park their appliance and uplift Riser pack, BA, Multi Storey BA Control Board, breaking & entering tools, extinguishers (1 x CO2, 1 x DP)
b) Identify the fire floor location either from the fire alarm panel, if activated or by interviewing an occupant or building manager.
c) Proceed to the fire floor by means of a convenient stairwell. Officers may consider using lifts subject to a full risk assessment. Once they are satisfied that firefighter safety would not be compromised then lifts may be used subject to ongoing re evaluation.
d) On arrival at the fire floor, proceed to indicated area and determine the extent of any threat of fire and fire extension. Report fire conditions to the Incident Controller and initiate any assistance request.
e) On finding a fire, the Officer and two Firefighters with BA shall attack the fire. The delivery shall be run from the riser outlet at least one floor below the fire floor.
f) The third Firefighter shall act as anchor person at the riser outlet location.

Lobby Control Crew Duties

The lobby control crew consisting of an Officer and at least two Firefighters shall:

a) Proceed to the fire alarm panel or Fire Control Room and interrogate the system. Obtain a building floor plan if available.
b) Contact the initial attack crew and pass on any relevant information.
c) Activate or isolate any building systems as directed by the Incident Controller.
d) Liaise with building representative if present and initiate evacuation if required.
e) The remaining crew shall access the nearest water supply and run uncharged hose to the riser and/or sprinkler systems.
f) If required, a crew member shall proceed to the fire floor to deliver available master keys to facilitate access to determine any fire extension.

Additional 1st Alarm Crews

Should the Multi Storey Building involved have a pre determined attendance greater than an initial two appliances, the additional 1st alarm appliance crews shall endeavour to park on alternative sides of the building to that of the first two arriving appliances.

Officers shall contact the Incident Controller to ascertain any immediate tasks they may be required to carry out, before proceeding on foot to Lobby Control.

Initial Response Crew Duties *continued*

Aerial Appliance Duties

Aerial appliances, when responded, shall be sited, and if the location of any fire is within their field of operations, they shall elevate and commence rescue and firefighting, in consultation with the Incident Controller.

In the absence of any confirmed fires, aerial appliance officers are to park clear of the building and await further instructions from the Incident Controller. Aerial appliances are not to be committed to any particular location until confirmation is received from the Incident Controller.

Officers in charge of aerial appliances should undertake an external survey of the building in their respective area and pass on any relevant information to the Incident Controller.

If the fire is outside of the aerial's field of operations, then they shall be parked well clear of the building, to minimise their exposure to falling glass and debris. Aerial appliance crews are to make themselves available for other fireground duties, or are to be released as determined by the Incident Controller.

Greater Alarms

Second Alarm Crews

Whilst proceeding to the building involved, Officers should undertake an external survey of the building and pass on any relevant information to the Incident Controller.

If a fire becomes well involved on a floor, external flame travel can occur from window to window. Personnel at street level shall continually observe exterior conditions, as the exact location of a fire will often be evident by window cracking or other signs. This can also be done from adjacent or opposite buildings, via handheld radio communications.

On arrival at a Multi Storey Building fire - second alarm, OICs of appliances shall contact the Incident Controller to determine what tasks have been allocated to them.

Third and Greater Alarms

At Third and Greater Alarms, crews shall report to the Incident Control Unit, with their Nominal Roll Tallies, for directions. In the absence of the Control Unit, Officers are to contact the Incident Controller for task allocations.

Alternatively, they may be required via Comcen, to report directly to a Staging Area and assemble ready for future deployment.

Appliances responding on greater alarms to a Multi Storey Building fire, should park sufficiently removed from the building to allow aerial appliance access and also to ensure an Outer Cordon safety zone is maintained around the building. **An outer cordon of at least 50 metres from the building should be initiated wherever possible.**

Incident Controller Task Allocation

Incident Controllers should consider the following tasks when allocating duties to greater alarm appliances:

a) Assist with the establishment of Lobby Control.
b) Assist in establishing a water supply and connecting to the buildings fixed firefighting systems.
c) Gaining control of the building management systems.
d) Direct relief crews to the fire floor to back up or relieve initial attack crews.
e) Search & rescue for building occupants affected by the fire.
f) Checking for vertical and horizontal fire extension.
g) Initiating and/or controlling any evacuation.
h) Establishment of Safe Forward Point.
i) Transfer of equipment via lifts / stairwells to the Safe Forward Point.

Fire Attack Strategy

Tactical approach

The decision to adopt an offensive or defensive tactical approach rests with the Incident Controller, based on the information given from fire attack crews. In adopting a tactical mode, Incident Controllers will take account of the size, intensity and progress of the fire, the fire loading of the building, the personnel and other resources available to fight the fire and the occupant life risk present.

The general tactical approach by firefighting crews should be to protect hallways and corridors, stairs and lifts and any other vertical openings in an effort to protect escape routes and to minimise the potential for fire spread.

Before attacking any fire, Officers should consider the possibility that occupants may be in the stairwell in the process of evacuation. Once the attack crew opens the door to the fire floor, the stairwell may become contaminated with smoke and other fire gases, making it untenable for evacuating occupants.

Officers need to consider the possibility of delaying entry into the fire floor, until the stairwell above the fire floor is clear of occupants.

Regular Sitreps should be given to the Operations Manager by the Safe Forward Point Officer, as to the progress of any fire suppression, to ensure adequate resources are deployed to meet anticipated demand.

Flashover & backdraught

Both flashover and backdraught are potential hazards of Multi Storey Building firefighting.

Officers in charge of fire attack crews must be aware of the potential hazards, the signs and symptoms of flashover and backdraught and the actions necessary to minimise the potential for these to occur. A clearly identified escape route and plan shall be formulated and communicated to crew members, before any fire attack activity is initiated.

Use of Stairs

Selection & use of stairs

Stairwells have proven to be the safest and most reliable route to the fire floor for a fire attack crew. Where a Multi Storey Building has more than one stairwell, then wherever possible, one stairwell should be reserved solely for firefighter access and operations and another stairwell reserved for occupant evacuation if necessary. This will help to limit the level of smoke contamination of the evacuation stairwell as much as possible.

It shall be a priority for the Incident Controller to determine the location and status (clear of smoke, being used for evacuation) of all stairwells within the building. Emphasis should be placed on determining stairwells that open to the roof of the building, in order to facilitate any ventilation operations.

Once a stairwell has been selected for the purpose of personnel and equipment transfer, all subsequent arriving crews should be informed as to the correct stairwell and where to access it. This can be accomplished by the stairwell signage being placed in a conspicuous position at LC.

All floors of a Multi Storey Building may not be served by every stairwell. When beginning an ascent of the building by the internal staircase, particular note shall be taken to check that it is not a “scissor” staircase.

a) Such stairs are in fact two separate stairs serving alternative floors, i.e.

   one stair will service first, third, fifth floors, and the other second, fourth,

   sixth etc.

b) It is not possible to exit the stairway, on a floor served by the other stair. Other crews shall be used to search from the opposite stairs. This will obviously cause a much greater staff commitment than normal.

Some buildings may have stairs separate to the main egress. These may be found where occupancy consists of more than one floor. The stair will begin and end within the occupancy.

(a) Where these exist they can serve as extra useful means of gaining access.
(b) They can also serve as additional means of vertical fire spread and this factor shall not be overlooked.

Stairwell pressurisation

To make firefighting operations from a stairwell more tenable, officers should select a stairwell that opens to the roof wherever possible, to enable efficient ventilation.

Consideration should be given to utilising any inbuilt stairwell pressurisation system, or pressurising the stairwell using Fire Service positive pressure ventilation fans.

Use of Stairs *continued*

Firefighting from stairwells

Deliveries shall be got to work from riser outlets on the floor below the fire floor, or a **safe place** on the fire floor.

Safety Note: In central core buildings, with stairs and lifts in the centre of the floor area, it is important that these deliveries come from either side, to ensure that the fire is not "pushed" back around on to the stairwell.

For security reasons, fire resisting doors onto escape stairways usually do not have latches on the stair side, only on the occupancy side. When making entry onto that floor, the doors (which open outward) will have to be forced.

Avoid doors closing over the top of uncharged hose, which when charged can be neither removed, nor the door opened.

Hose congestion on stairs can be a problem. All hoses shall be laid out in a single bight where possible, with every attempt made to minimise kinks and bends.

The tactical approach by firefighting crews should be to protect hallways and corridors, stairs and lifts and any other vertical openings in an effort to protect escape routes and to minimise the potential for fire spread.

Vertical Fire Spread

Vertical Fire Spread

Vertical fire spread can occur through a variety of openings. A thorough check shall always be made on:

(a) Ducting which passes through the fire compartment;
(b) Plumbing or other piping passing throughout to higher (or lower) floors;
(c) Wiring which passes through the fire compartment.

It is possible to find service shafts, which are open from the top to bottom of the building. These will require very careful checking.

Note Lift shafts fall into this category.

Watch for horizontal and vertical fire travel through ducts and improperly sealed pipe and cable passages. Shining a torch light into a shaft will make smoke visible in the light beam.

Safety Consideration

Falling Glass

Avoid if at all possible, the breaking of windows, as sheets of glass falling from a height could be fatal to people below.

Safety Note: Crews needing to break exterior windows on upper floors shall first seek permission to do so, from the Operations Manager, or in their absence, the Incident Controller.

Because of the potential for falling glass and other debris due to the fire conditions, it is important that crews at street level are made aware of this hazard and arrange with Police for evacuation of bystanders.

It is essential that crews at ground level maintain an Outer Cordon safety zone wherever possible, **of at least 50 metres** around the building, to ensure the safety of personnel operating outside the building and also members of the public and building evacuees.

Consideration should also be given to the protection from falling glass, of riser and sprinkler inlet hose and pump feeder lines, to ensure continuation of water supplies to fire attack crews.

Building Evacuation

Danger to building occupants

In the event of a Multi Storey Building fire, danger to building occupants could develop from three sources:

a) Occupants may be directly exposed to the fire itself.

b) There may be panic amongst occupants in the knowledge, or the belief, that there is a fire in progress somewhere in the building.

c) Building occupants may be exposed to smoke and other products of combustion.

Evacuation of occupants

Large Multi Storey Buildings can contain many hundreds of occupants, particularly during normal operating hours. The full evacuation of a Multi Storey Building may be impractical, given the time required to evacuate and the impact such evacuation could have on Fire Service operations in controlling any fire.

Modern Multi Storey Building fire suppression and evacuation systems can enable an Incident Controller to initiate a progressive evacuation of occupants, which ensures that those people at greatest risk are evacuated first. The accepted approach is to evacuate two floors above and two floors below the fire floor, in addition to the fire floor occupants themselves. Any evacuation can then be expanded, based on this formula, to ensure the safe and efficient evacuation of all at risk occupants.

If the spread of fire is significant and rapid, the Incident Controller should not hesitate in deciding to evacuate the entire building. However, this will still need to be implemented in a controlled and coordinated manner to be efficient and should follow the same principles as a progressive evacuation.

Evacuation communication

Advantage should be made of any Evacuation Warden Intercommunication System (EWIS), or public address system available, to facilitate communication with building occupants on affected floors.

Such systems can be used to speak to all floors simultaneously, or to selected floors only and are usually found in the Fire Control Room of the building. Information on safe evacuation routes and stairwells, safe refuge locations and progress reports on Fire Service operations, can help avoid panic amongst building occupants

Building Evacuation *continued*

Evacuation prior to arrival

If an evacuation is underway prior to Fire Service arrival, every attempt must be made to gain control of the process. The ability to control stairwells unencumbered with evacuating building occupants, will assist in fire suppression operations.

On arrival at a confirmed fire, with occupants already evacuating, the Incident Controller shall determine which stairwell is the most suitable for fire attack crews to utilise. Resources shall then be concentrated in that stairwell, designated the Fire Attack Stairwell, with a view to deploying firefighters to each floor to control and redirect the evacuees to an alternative stairwell designated the Evacuation Stairwell.

In Multi Storey Buildings with only a single means of egress, this option will not be available to the Incident Controller and any tactical approach determined by the Incident Action Plan, may have to factor in possible delays in firefighters gaining access to the fire floor.

Fire Service Evacuation

Evacuation of firefighters

Fire conditions and building integrity are to be closely monitored during a Multi Storey Building fire. If the Incident Controller considers that the risk to firefighters outweighs any potential benefit likely from the continuation of search and rescue, or firefighting operations, then a full evacuation of all Fire Service personnel shall be ordered.

Such an evacuation may be communicated using hand held radios, building public address system and the traditional means of continuous sounding of fire appliance sirens at ground level (or a combination of all three).

Safety Note: Upon the evacuation order being given, interior crews shall not hesitate to commence their evacuation by the most expedient means available.

Salvage

Salvage operations

Fires in Multi Storey Buildings can result in large-scale salvage operations requiring the commitment of significant numbers of personnel. Salvage operations should be an integral part of fire suppression operations. The earlier salvage operations are started, the greater the chance of minimising indirect loss caused by suppression activities.

When salvage is required the Incident Controller should consider assigning the role of Salvage Officer to a suitable officer.

Size up

Effective salvage operations begin with an accurate size up and a timely operational plan. Locating the seat of the fire, or source of water flow, will initially indicate what part of the building is involved, where the fire/water is going and any additional hazards.

Salvage should begin where the greatest loss is expected. Priorities should be quickly established, based on location, value, susceptibility to damage and the type of occupancy involved. The size up process can be assisted through liaison with a building representative, if available.

Water channelling

Before channelling water into any vertical shafts, the following should be considered;

a) Water running into a lift shaft may put the lift out of service when it may be needed to transport further personnel and equipment.
b) Electrical plant rooms and lift machinery should be protected.
c) There is the potential for water to run down the inside of exterior walls onto floors below.
d) The terminus of any shafts, usually basements or lower floors, may have to be pumped out.

Depending on the type of incident and building occupancy, it is often advantageous to channel water directly into stairwells for removal purposes. This is generally the best method for the removal of large quantities of water.

Multi Storey Building Procedure
Operational Procedure No 26 - Part 5
BA Control (DRAFT)

Overview

Introduction

The purpose of this procedure is to ensure the safety of Fire Service Personnel without compromising the effectiveness of rescue and fire suppression activities.

Normal BA control procedures are not always practical during the initial stages of a Multi Storey Building incident. In addition, the operation of Phase II BA Control will differ from a normal ground level fire.

During the early stages of such an incident all personnel shall place an urgent priority to achieving the situation whereby each BA crew is being monitored by an Entry Control Officer (ECO).

In this section

The following topics are included in this section

Initial Attack BA Crews

Initial Attack BA Crews

Initial attack BA crews refers to all crews tasked with locating the fire and or occupants to be rescued during the early stages of a Multi Storey Building fire i.e. at least until the arrival and deployment of greater alarm crews.

BA Tallies

Due to the extent of the areas to be covered in a Multi Storey Building, it is impractical to expect them to leave BA tallies at Lobby Control in the early stages of the incident. As crews will not know, prior to entering the building, where they will be working one of the most important aspects of BA Control would be missing. Therefore, they shall take their BA tallies with them.

When the initial attack crews start-up their BA, **they shall be aware that they are doing so without full BA control in effect**. Therefore they shall follow, very carefully and fully, these procedures:

(a) Personnel wearing BA to search a smoke filled floor area or

for firefighting on a floor area shall enter from a place of safety.

(b) A guideline or hose line run from a place of safety is to be used to provide an effective line of retreat.

BA Entry

Initial Attack Crew Entry

When Initial Attack crews start-up and enter a floor for either firefighting and/or search & rescue purposes, they shall:

(a) Ensure that a minimum of two firefighters comprises a BA crew and that the crew is under the direct control of an Officer.

(b) Ensure that a Multi Storey BA Control Board is available to manage the entry control function. In the absence of such a board a traditional EC Board is to be supplied to the entry point.

(b) Ensure that one crew member remains at the entry point (usually the stairwell) to manage the entry control function.

(c) After the delivery has been run out from the riser the BA tallies shall be attached to the Multi Storey BA control board.

(e) The Officer shall make every endeavour to communicate their floor location and point of entry to either Lobby Control or relief officers already in attendance.

Safety Note: At all times any relief crew must be able to find the entry location and control board belonging to the BA crews and a delivery or line to follow directly to that crew.

Working as two BA crews

Wherever possible consideration shall be given for 2 person BA crews to combine and work together if possible. This action enables:

(a) Instant assistance to be given to any one crew that gets into difficulties.

(b) Faster searches to be made of individual floors (with one crew operating off each side of a guideline).

(c) BA crew operations to be led by and be under the control of an Officer.

Initial Crew Location

To simplify the task of the ECO and relief personnel, initial attack crews shall attempt to communicate their situation, when entering by any means available. Such means could be:

(a) UHF radio.
(b) Building telephone via the communications centre or direct to LC.

Entry Control

Entry Control At Lobby Control Point

The Lobby Control crew, on the first alarm, has the responsibility to ensure the establishment of the Lobby Control Point.

Initially, and until a Safe Forward Point is established the first priority of the Lobby Control Officer (LCO) shall be to establish BA entry control in the lobby.

a) The LCO shall assume the responsibilities of BA ECO.
b) This will require communication with the anchor person at the fire floor entry point.
c) Progress past LC shall be regarded as "entry" until full BA Entry Control is transferred to the Safe Forward Point at a later time.

ECO's initial duties

The first task of the ECO shall be to have the initial working crews relieved.

In arranging the reliefs the ECO shall proceed as follows:

a) The initial attack crew(s) once relieved shall seek instructions from the Operations Manager or in their absence the Incident Controller.
   (i) Once the relief crew(s) find the initial attack crew(s) they shall instruct them to return to the **SFP immediately**.
   (ii) The relief crew shall take over the fire attack and/or search & rescue functions knowing their BA working details are recorded and monitored by an ECO.
   (iii) The initial attack crew shall return to the **SFP** and report to the OIC taking their tallies with them.
   (iv) They shall report the specific location where the relief crew(s) are now working and those details shall be entered on the Entry Control Board.
b) The ECO shall contact the Control Unit (or the initial attendance appliances if the Control Unit is not yet in attendance).
   (i) ECO shall obtain the names of the personnel who have entered the building. The names shall be obtained from the nominal roll tallies.
   (ii) ECO shall write the names on the back of a Hazchem Board.

Entry Control *continued*

Transfer of Entry Control

Entry control established as above shall function in that location until all personnel who initially entered the building have been found and accounted for.

When the Safe Forward Point is established an Entry Control Point shall be set up there. The lobby control ECO shall continue to function until:

(i) All initial attack crews are accounted for, and
(ii) The relief crews have either returned, or been relieved by other crews from the Safe Forward Point entry control point.

The Lobby Control Officer shall have first call on arriving crews for relief purposes as required above. He may get the relief crews from:

(i) The remainder of the initial attendance appliance crews.
(ii) Crews arriving on second, or greater, alarm appliances.

When transferring Entry Control from the Lobby Control Point to the Safe Forward Point, the ECO shall ensure:

(i) That tallies stay with the board they were "timed" from. (The whole board with tallies attached shall be transferred.)
(ii) The crews that "entered" from the lobby are informed to "exit" to the Safe Forward Point, and that EC points location

Entry Control at SFP

As operations progress the control of BA personnel will become a function of the Safe Forward Point.

Once entry control is transferred from the LCP to the SFP then the SFP shall be regarded as "entry".

This shall apply until Phase II BA Control is in full operation, after which entry control points may be established at locations ahead of the SFP. The SFP Officer may consider the establishment of EC points closer to the fire floor when the SFP is not in close proximity to the fire floor and the stairwell access is clear of smoke.

Phase II BA

Phase II - BA Control

Phase II BA Control is normally associated with the BA Tender. At a Multi Storey Building fire the BA Tender will essentially become a cylinder recharging facility. Phase II Control, set disinfection, set recommissioning and minor repairs will be conducted elsewhere.

At Multi Storey Building fires the location of the BA Control Officer and Phase II BA Control is to be determined in consultation with the Resource Commander or in their absence the Operations Manager. To be effective, consideration is to be given to locating Stage II BA Control at either the SFP, or Forward Staging Area.

Upon arrival at such an incident the personnel on the BA Tender shall arrange for the following to be taken to the Lobby Control Point, for transfer to the SFP or Forward Staging Area):

- BA Control Board and pencils.
- Entry Control Boards.
- BACO and ECO jerkins.
- Complete set of disinfection equipment including clean cloths.
- All spare BA sets complete.
- All spare full cylinders.
- Spare guidelines complete.

The Lobby Control Officer shall arrange for all the foregoing to be transferred quickly to the SFP.

Phase II BACO

The Operations Manager or in their absence the Incident Controller shall appoint an Officer to establish Phase II BA Control. That Officer shall assume the role of BACO until relieved and shall be responsible for:

a) Arranging suitable communications to be established between BA Control, each ECO and the BAT.
b) Assembly and availability of sufficient rescue and relief crews.
c) Designating a disinfection and recommissioning area and ensuring adequate staff are assigned to such tasks.
d) Keeping the Resource Commander and/or Operations Manager fully informed of the BA situation. BACO will also liaise with the SFP Officer re the BA situation.
e) Arranging for empty cylinders to be taken to the BA Tender for recharge and for full cylinder to be returned.
f) Giving a complete BA situation report to any Officer appointed to relieve him.

Long Duration BA

Long Duration BA

Because of the size and complexity of many Multi Storey Buildings the demands on the fireground BA resource can at times be extremely high. The logistics of transferring personnel, BA sets and spare cylinders up to the SFP means that every opportunity to ensure the efficient use of BA should be taken advantage of.

Incident Controllers shall give consideration to the use of long duration compressed air BA when available. In so doing, consideration must also be given to firefighters having to wear long duration sets in arduous conditions. The health and safety of personnel, given the conditions existing at the time must be taken into consideration whenever a decision to use long duration BA is made.

Multi Storey Building Fires
Operational Procedure No 26 - Part 6
Use of Lifts (DRAFT)

Overview

Introduction

This procedure covers procedures when using lifts in a Multi Storey Building involved in fire.

In this section

Lift Use

Standards & Regulations

The relevant standard for lifts is **NZS 4332:1997** Non Domestic Passenger and Goods Lifts.

The facilities for Fire Service control of lifts are set out in the **Power Lift Rules 1989**, issued by the Marine Division of the Ministry of Transport.

Lift Use

Although lifts are necessary for moving large numbers of people throughout a Multi Storey Building under normal circumstances, experience has proven that the operation of lifts under fire conditions can be erratic and dangerous. Lifts are subject to serious malfunction from the effects of heat, smoke and water on drive machinery and/or control equipment.

Many instances have occurred overseas of firefighters and building occupants losing their lives whilst operating lifts at fires. However, as multi-story buildings increase in height to over 100 storeys, it becomes practically impossible to transport firefighters and equipment to upper floors without utilising them in some way.

One of the initial actions by the Incident Controller in a Multi Storey Building fire is to restrict the use of lifts by both building occupants and firefighting personnel until the safety of the lift system can be determined.

At every Multi Storey Building fire the use of lifts shall be delayed until Fire Service personnel deem they are safe to use. If any smoke is visible in a shaft (smoke will be able to be seen through a light beam shone up or down the shaft) the lift shall not be used. Fire alarm detectors activated in a lift shaft will cause the lift to stop.

Regular sitreps from the fire attack crews regarding the safety of lifts and the impact that any changes on fire conditions or fire travel may have on the lift system shall be communicated via the SFP to the Lobby Control Officer.

Check Lifts for occupants

It shall be a priority for the Incident Controller to determine the location, occupancy and status of all lifts within the building. Upon finding persons trapped within a lift during a fire an assessment is to be made to determine the risk to the occupants and therefore the urgency required to undertake any rescue operation.

Any rescue operation of people from lifts should be conducted in accordance with the National Commander's Instruction 28 – Lift Incidents

Lift Use *continued*

Exceptions

Early consideration of lift use may be acceptable when split bank lifts exist and the top of the lift shaft and machinery room is a minimum of five floors below the reported fire floor.

Some buildings have lift shafts servicing selected floors, up to the 10th floor, 11th to 20th floor etc. Extreme care must be taken when called to the middle floors to ensure the correct lift is available.

Initial attack crews travelling in lifts in this instance must be equipped with donned and started BA, a portable dry powder extinguisher at the ready and an item of breaking & entering equipment such as a halligan tool. In addition, powerful hand held lighting should also be taken in the event of any lighting system failure.

Firefighters Lifts

Firefighters Lifts

Lifts shall only be used at the direction of the Incident Controller at the time.

Regulations for new buildings require that on the operation of the Fire Alarm or Sprinkler System, all lifts immediately return to a designated floor (this may not always be the floor commonly known as the ground floor) where they shall remain with doors open.

A Firefighters Lift Switch may be found sited either next to the lifts themselves, with the alarm panels or in the Fire Control Room. Activating this will bring any firefighter lifts to the designated floor to remain with door open. When manual recall has been activated and all lift cars have reached the ground floor all cars are to be checked for occupants.

Safety Note: The whole concept of operation of this system is that any firefighter's lift shall operate on **CAR CONTROL ONLY**.

Firefighters Lifts *continued*

Firefighter Lift Operator

Lifts constructed since the introduction of the Power Lift Rules 1989 require them to be controlled from within the lift. A firefighter shall be assigned to the lift to act as lift operator.

The lift operator shall have available as safety equipment a BA set, powerful handheld torch, DP extinguisher and a handheld radio.

a) In car control mode the automatic door opening feature and any photo electric devices are rendered inoperable.

b) To move the lift, the designated floor button shall be pushed then the door close button pushed. The door close button shall be pressed until the doors have shut. **DO NOT** put your hand in between the doors because in this mode, the doors will keep closing.

c) To open the door before the lift has moved release the door close button.

d) To open the doors on the designated floor, press the door open button until the doors have fully opened.

e) **No more than six personnel** (including the lift operator) shall be permitted in any lift car. This is to prevent overloading and will also limit the number of personnel placed out of service if the lift becomes disabled.

f) Lifts should be programmed to stop every five floors (precautionary stops) to confirm that the lift will respond to the manual floor selections. Before leaving each precautionary stop the lift shaft shall be inspected with a hand held light to determine if there is any accumulation of smoke.

g) The position of the lift relative to the nearest stairwell must be noted at the first precautionary stop. This is necessary in the event that the lift stops on a floor compromised by smoke or fire and the lift car has to be abandoned.

Firefighters Lifts *continued*

Transportation of equipment

Some older types of lifts, pre 1989, can be used for the transportation of equipment only. The firefighters lift shall be on 'car control only' and will have stopped with the doors open on the designated floor.

a) Requested equipment can be loaded into it, and the button for the SFP floor actuated, leaving the lift before the doors close.

   i. The lift will travel to the SFP where the doors will open and the equipment can be unloaded.

   ii. The unoccupied lift (or perhaps with empty BA cylinders) shall then be returned to the LCP in a similar manner.

b) Firefighters shall use the safety of the stairs while only the equipment is carried up by lift.

General

Factors to consider

Factors to be considered concerning lifts are:

a) **Location of fire.** If a fire can possibly be reached by using stairs instead of lifts, it is advisable to do so.

b) **Lifts shall not be used for fires, which are involved and developed,** as the lift cables and car will have to pass through the fire floor or floors. Lift wells and doors are constructed to an approved fire rating but there is always the possibility that the lift may be compromised.

c) The lift shall be stopped and crews proceed on foot at least **five floors** below the fire. The possibility of stopping the lift at the fire floor and the doors opening exposing the crew instantly to the full blast of fire is the ultimate danger.

d) Some lifts still have electronic call buttons, which can be activated by heat, normally body heat from the finger of the user. During a fire, the heat generated by the fire may activate the call system to bring the lift to that floor with the obvious dangers.

e) Some lift doors have a sensor system which prevent them closing if there is an obstacle still in the door opening, Smoke could be the obstacle which will prevent the lift doors shutting, especially if the lift is not controlled. The lift will stay on the fire floor.

f) Lifts that have been exposed to fire may have damaged lift doors that will not operate correctly.

High rise Building Procedure
Operational Procedure No 26 - Part 7
Building Systems (DRAFT)

Overview

Introduction

Multi Storey Buildings have a range of systems and facilities, which can assist the Fire Service in dealing with a fire in the building.

Building Systems can vary greatly depending on the building, occupancy type and time of construction. Personnel should become familiar with the various types of building systems in their area during the pre planning and risk management process before any incident occurs.

The following section provides an overview of the types of facilities that may be encountered and utilised by firefighters.

In this section

The following topics are included in this section.

Riser Mains/Fire Hydrant Systems

NZ Standard 4510

The relevant standard for building hydrant systems is **NZS 4510:1998 Fire Hydrant Systems For Buildings.**

Risers

There are three types of hydrant systems, more commonly known as risers that firefighters may encounter in Multi Storey Buildings. All three operate on the principle that water should be available for firefighting purposes via an internal main system with outlets on each floor (usually in a stairwell or adjacent lobby). The hydrant system must have the ability to be connected to by Fire Service pumps and some may be fed by internal pumps located in the building.

a) Dry Risers – an internal hydrant system, which is normally dry but is capable of being charged with water from Fire Service appliances via a Fire Service Inlet connection at street level. NZS 4510:1998 no longer allows dry risers so these may only be found in older buildings.

Safety Note: Officers should be aware of the potential for landing valves on other floors to be open resulting in loss of flow, pressure and water damage. Officers need to ensure the air valve at the upper most point of the system is functioning and that if it isn't then air will need to be bled from the system by other means as the system is charged.

b) **Wet Risers** – an internal hydrant system for firefighting purposes permanently charged with water from a pressurised supply sufficient for firefighting. This system may require boosting from Fire Service appliances via a Fire Service Inlet connection at street level.

c) **Charged Risers** - internal hydrant system charged with water. These systems are to be charged and pressurised with water at all times. The firefighting water supply must be provided from Fire Service appliances via a Fire Service Inlet connection at street level. All systems from NZS 4510:1998 should be of this type.

Riser outlets

NZS 4510:1998 requires that riser outlets comprise twin outlet couplings per floor. However, some of the older systems may still have single outlet connections.

Riser outlets may be located in horizontal safe paths and therefore **may not necessarily be found in stairwells.**

Riser Mains/Fire Hydrant Systems *continued*

LC Officer responsibility

One of the responsibilities of the LC Officer will be to ensure that a Fire Service appliance connects into the building riser system to supply firefighting water to fire attack crews.

It shall also be a priority to ensure continuation of a water supply, at the required pressure to firefighting crews via the internal riser system.

Safety Note: Normal pumping pressure into a FSI shall be 1050 kpa but if required may be increased to a maximum of 1200 kpa. Delivery hose connected into a FSI shall wherever possible be connected to the offside of the pumping appliance.

Fire Control Rooms

Fire Control Rooms

As multi-story buildings become more complex and sophisticated so have the inbuilt fire alarm and suppression systems. Many Multi Storey Buildings now incorporate a Fire Control Room which enables the Incident Controller to monitor fire travel, undertake progressive evacuation, control critical building services and initiate specific building features that may assist in fire suppression operations.

FCR features

Features which Fire Service Officers may find in Fire Control Rooms might include, but not be limited to;

a) **Analogue addressable fire detectors** – these enable the Fire Service to identify the exact location of any activated smoke or fire detectors. The system only displays the most recently activated detector. To determine the path of smoke or fire officers are able to scroll back via the LCD display to view previously activated detectors.

b) **Lift status and control functions**

c) **Air handling systems controls (HVAC)** - this can incorporate manual overrides and system isolation and restart switches. In addition, stairwell pressurisation can be controlled if the building is fitted with this feature.

d) **Evacuation Warden Intercommunication System** – this enables the progressive evacuation of the building in addition to the ability to communicate with wardens on a floor by floor basis. Public address capability also allows direct communication with building occupants.

e) **Building infrastructure isolate and reset controls.**

f) **Building plans, services and systems information.**

Building engineer

Due to the complexity of the modern Multi Storey Building it is recommended that Incident Controllers attempt to contact a building services engineer or other building representative with a working knowledge of the building systems at the earliest opportunity.

The knowledge and expertise available from such a site representative may be invaluable in utilising the inbuilt systems to assist in fire suppression and evacuation operations.

HVAC

Strategic use

The strategic objectives of effective HVAC management are to use the system to limit the spread of fire and to control the movement of smoke within the building. The utmost care shall be exercised in using HVAC systems during a fire, as although they may be helpful in ventilation, they can also be instrumental in spreading the fire.

To utilise the HVAC system to its full potential the Incident Controller must know how the system functions and have a strategic plan for its use.

General points to observe

Most multi-story buildings are fitted with some form of ventilation or air conditioning system. However, as these systems vary so much in their construction and operation, no definite rules can be laid down.

The following are general points:

a) The general principle of a HVAC system is that when a fire has been detected in a Multi Storey Building the system should **not** assist in the spread of smoke and fire gases throughout the building.

b) Fire can obviously travel through air conditioning ducting. Where this ducting penetrates fire resisting construction, dampers or automatic fusible link closing shutters are fitted in the duct. These should operate and close off the duct and so minimise the potential for fire spread.

c) Some buildings have flexible ducting made of plastic, which can itself burn, or melt and become inoperative.

d) Those parts of systems, which recirculate air within the building, may spread smoke and fire to unaffected areas. Consequently a good general policy is for this part of the system to be shut down immediately a fire is discovered. In more modern buildings with PFA's these recirculating fans are normally shut off on the actuation of the alarm.

e) Some buildings rely on pressurised stairwell to assist in the safe evacuation of occupants. This area is pressurised relative to the rest of the building, usually by its own section of the air conditioning system. This section of air conditioning should normally be left operating.

f) The use of positive pressure fans can assist in pressurising a stairwell and therefore keeping this area relatively smoke free.

Strategic Plan *continued*

HVAC strategic operating plan

The Incident Controller at a confirmed fire in a Multi Storey Building shall consider the following;

a) Determine the status of all HVAC systems in the building. Any systems that have not been automatically shut down shall be manually shut down.

b) Before any further action can be taken the fire floor must be accurately determined.

c) After the fire floor has been determined all HVAC zones that do not include the fire area may be reactivated. This should supply fresh air to these zones, pressurising them and limiting the spread of smoke.

d) Consider pressurisation of stairwells either by means of the building system or through Fire Service PPV fans.

Safety

HVAC reactivation

Whenever the HVAC systems are reactivated after a period of shut down all crews operating in the building shall be alerted and requested to report any observed adverse effects on fire behaviour or smoke travel as a result of the HVAC reactivation.

Heat buildup

Personnel must be aware that buildings with HVAC systems are totally self-contained from the outside atmosphere.

The shut down of such systems will also eliminate the normal air cooling functions. Therefore personnel shall expect a much higher temperature within the building. This will have an obvious effect on working crews. Officers shall ensure regular reliefs are provided to minimise the risk to the health of personnel.

Multi Storey Building Procedure
Operational Procedure No 26 - Part 8
Buildings Under Construction (DRAFT)

Overview

Introduction

This procedure covers firefighting procedures in Multi Storey Buildings under construction.

In this section

The following topics are included in this section

NZ Standard

Requirements

The New Zealand Standard 4510, 1998 states:

Buildings Under Construction

During building construction when a Multi Storey Building requires the installation of a permanent fire hydrant system the building hydrant system shall;

a) Be installed and brought into commission progressively as building work proceeds.

b) Be functional, with outlets on every floor up to a level not lower than 9 metres below the highest floor slab.

c) Indicate the highest outlet by means of a temporary tag labelled "Highest Functional Outlet" unless it is readily obvious by observing the pipework that this is the case.

d) Provide for Fire Service inlet accessible from the street frontage. The location of such inlet shall be marked by a red panel in the perimeter fence with the words painted in white "Fire Service Inlet".

Buildings Under Demolition

During the demolition of a building fitted with a fire hydrant system;

a) The system shall be maintained in a functional state for as long as possible and shall be the last service removed.

b) Removal shall not occur before combustible contents of the building have been removed.

c) In Multi Storey Buildings the hydrant system shall remain functional on the floor below the highest intact floor.

Safety

Additional hazards

Fires in buildings under construction present many additional hazards to firefighters.

a) The structure will not have reached its design specification in regard to compartmentation and fire spread control.

b) Crews can easily become trapped by rapid and unexpected vertical and horizontal fire spread.

c) Officers shall take extra care to ensure that the means of escape is kept clear in such circumstances.

d) There will be many openings in floors and walls awaiting the fitting of doors, windows, air conditioning etc. Firefighters shall take extra care when moving about a Multi Storey Building under construction where visibility is impaired through smoke etc.

e) All crew operating in such conditions shall be closely supervised by their Officer to maintain safety standards.

f) All identified hazards should be eliminated, isolated or minimised. Part of this process will be to communicate all known hazards to crews entering any floor for firefighting or search and rescue purposes.